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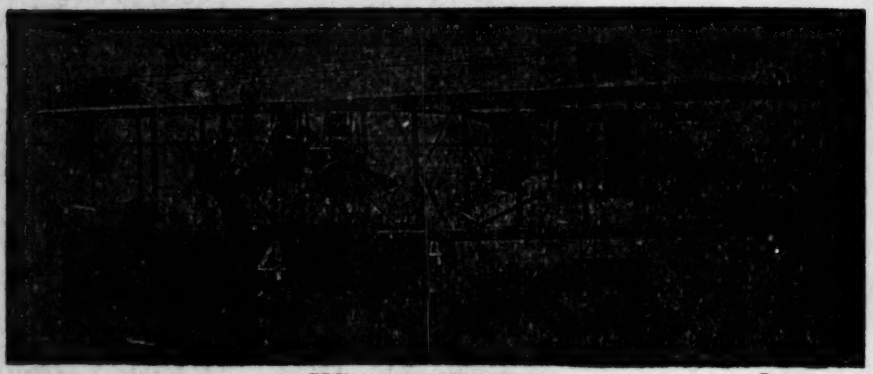

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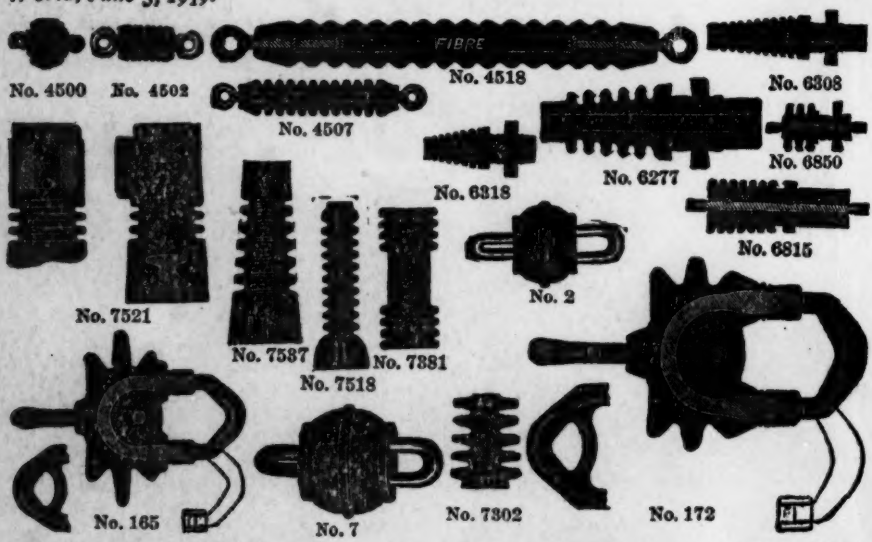

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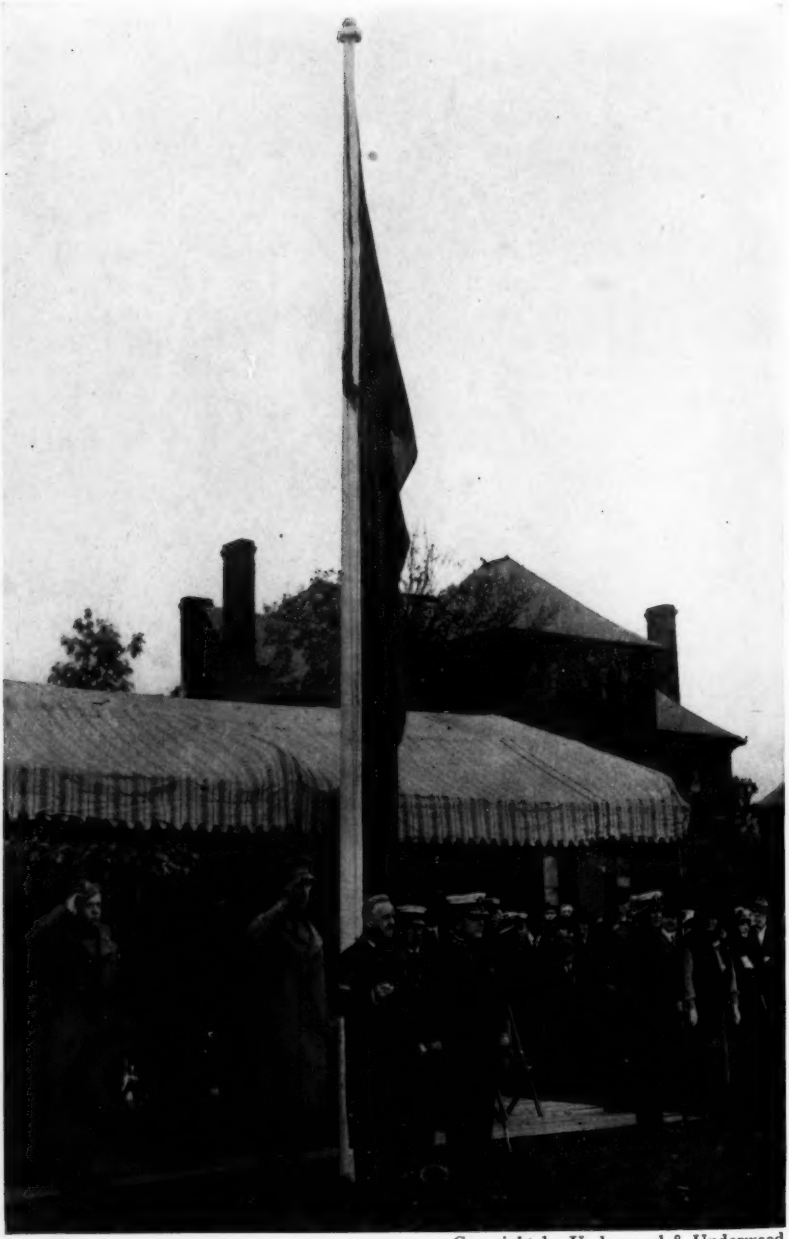

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THE KING OF THE BELGIANS AT THE U. S. NAVAL ACADEMY.

UNITED STATES NAVAL INSTITUTE PROCEEDINGS

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

DISCIPLINE

By CAPTAIN F. B. UPHAM, U. S. Navy

By the declaration of war the American people issued a command to Germany to desist from certain activities.

By the mobilization, organization, training, transportation and supply of our armed forces we backed up the command with such force as gave authority to that command.

In company with the Allies we proceeded to discipline Germany —that is, to discipline in the more restricted sense of prevention from and punishment for wrongdoing.

It required discipline in the higher and broader sense, however, to accomplish that degree of preparation that was essential to give force and authority to our command.

From the point of view of the whole people this discipline in the broader sense took the form of self discipline. We recognized our obligations, passed laws to meet them, and looked to our Chief Executive to exercise our authority.

The efficient exercise of this executive authority, in so far as it pertained to the handling of the armed forces, was possible only by reason of the traditions of the service and the schooling and training in the practice of discipline by the armed forces already in service.

War, however, is a demoralizing phenomenon of human endeavor. While it calls for the most scientific organization and employment of force, and for the use of the most highly scientific instruments, its results are destruction in the most terrible form.

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During hostilities the slaying of human beings and the destruction of property have, under certain circumstances, become legalized.

Discipline and the end in view have served to hold our forces together to the attainment of that end, and this even in the presence and accomplishment of legalized destruction of life and property.

But the suspension of the rules as to two of the Ten Commandments shakes the moral fiber not only of the soldier in the field but as well of him in the rest area, and even of the civilian far removed from the scene of actual combat. There results a less keen observance of the laws of *meum* and *tuum;* and the sanctity of womanhood requires more than the normal peace-time protection.

This lowered moral fiber of a people continues long beyond the conclusion of hostilities. Indeed, in our present case, the cessation of hostilities marks the accomplishment of the end in view and leaves to discipline alone the preservation of moral standards; and this at a most critical period, when the human tendency is to let down, to relax.

Throughout the nation we see evidences of this, in one or another form depending in some measure upon the individual's walk in life, and certainly upon his previous moral training. One man steals, another sells his Liberty Bonds for transitory pleasures, another goes into debt for the same purpose; gambling in high and low degree becomes rife. All these are evidenced in the lives of individuals, while the reaction upon the community is found in industrial unrest and in strikes.

Recovery must be slow, and this because of the inertia of individuals. But recovery must, and can best, start with the efforts of those trained to discipline, particularly self discipline. It is to such that the nation must look for leadership. It is because of this need for leadership in discipline that the whole country views with concern the striking of one city's police force—a force trained to discipline and specially trained to uphold law and order. Should the community fail of the benefits of the presence of such a disciplined force, then indeed, is the situation one to cause alarm.

Likewise, and to a far greater degree because of the purpose for which the armed forces of the nation exist, is it incumbent upon us to take the lead in recovering the country to a disciplined state of mind.

A slouchy police force is cause for chagrin on the part of residents in a city to which visitors may come. It indicates a town not well run; and certainly it is not a good advertisement for the town.

Likewise, a slouchy personnel on board ship is indicative of the state of discipline on board that ship. The careful observance of salutes, of the uniform regulations, and of the etiquette of the quarter deck should be instilled into the minds of all and practiced religiously.

During the war there grew up a degree of carelessness in these matters resulting from the abnormal expansion in, and repeated transfer of, officer and enlisted personnel; and the conditions of living on board ships transporting troops and performing other arduous duties were such as to invite relaxation from normal standards.

With the cessation of hostilities there could not be immediate return to normal. Lax habits, so readily and quickly formed, require the exercise of special care, tact and firmness to correct. Neglected, they rapidly grow worse.

Every opportunity now offers for returning to the normal observance and practice of the outward and visible signs of discipline that serve to establish in the minds and consciousness of young officers and men that attitude towards discipline that must be attained before we can feel the navy to be again ready to meet expansion for the successful training and handling of a large personnel and the successful disciplining of the enemy.

Finally, the country must look to us as to a bulwark against forces that would disrupt the community, and we cannot fail them. The obligation of leadership in these matters of discipline is greater than a duty—it is a high privilege.

A disorderly police force is cause for disgrace on the part of residents in a city to which visitors may come. It indicates a town not well run; and certainly it is not a good advertisement for the town.

Likewise, a disorderly personnel on board ship is indicative of the state of discipline on board that ship. The careful observance of salutes, of the uniform regulations, and of the etiquette of the quarter deck should be instilled into the minds of all and practiced religiously.

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THE YANKEE MINING SQUADRON

OR

LAYING THE NORTH SEA MINE BARRAGE

By CAPTAIN REGINALD R. BELKNAP, U. S. Navy
The Squadron Commander

(CONTINUED)

CHAPTER NINE

ATHLETICS

A shortage of some mine parts that had encountered difficulty in manufacture now delayed the preparation for a second excursion, and the respite came opportunely, for we had been driving hard for some time.

Though the minelayers were comfortable enough to live in when empty, it was quite different with mines on board. Then only a few of the men could swing their hammocks, the others having to lie on the decks. Crowding the mess tables together, horns and sharp corners ever ready to tear the clothes, mines were constantly at one's elbow, and everywhere were mine tracks, half-knee high, or turntables, to trip the unwary or bark his shin. No smoking was allowed below decks, and the space above decks was very limited for crews so numerous. The men made no complaint—such men will not complain of discomfort which seems temporary and unavoidable, when incident to an undertaking that interests them—but since the discomfort could not be alleviated but, on the contrary, would increase with the frequency of excursions and with inclement weather, sufficient diversion was imperative to maintain the fine, cheerful spirit which had characterized the work so far.

Let the report on squadron athletics, written at the end of September by Ensign Walter P. Hanson, U. S. N. R. F., editor of our *Athletic Bulletin*, tell what was done, in true sporting page style:

The situation was new, practically unparallelled, and called for immediate action. With the exception of the *San Francisco* and *Baltimore*, none of the ships had the traditional atmosphere of a man-of-war, so essential to the building up of *esprit de corps*. It was a new squadron, manned largely by new men, performing a new operation in strange waters. Something was needed to weld this war-sprouted organization into a solid, indissoluble

unit, to build up ship spirit and a high squadron spirit, recalling old traditions and laying the foundation for new ones, to fire the men's enthusiasm to a pitch that would insure the success of the gigantic operation in hand and spell defeat for the German submarine forces.

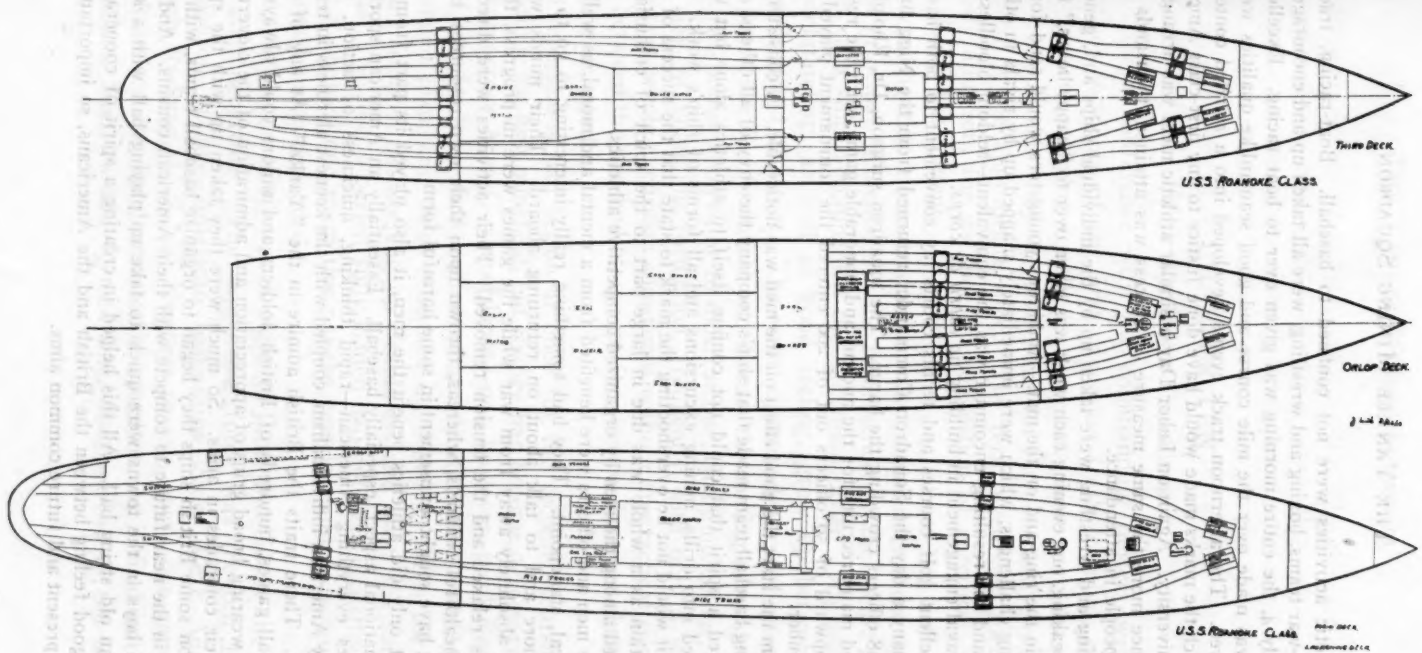
There were other just as important reasons why an athletic organization was necessary. Minelaying in contested waters is not the easiest nor the least dangerous of duties. To eat, sleep and work in close proximity to tons of the deadliest explosive known, and then to cruise day and night in submarine infested waters with this same explosive for cargo—knowing that one well-aimed torpedo, a well-placed mine, or a few enemy shells, would wipe out an entire ship's company, and possibly the whole squadron—is not exactly the sort of recreation a worn-out business man would seek as a cure for "nerves." And blue-jackets, despite a common fallacy in America, are no more than human. Numerous mining excursions, with no intervening periods of recreation, were bound to tell on the men.

Relaxation and amusement they would get in one form or another. Where were they to turn for it? To the theaters and amusement centers of two Scotch, war-stricken villages? They were almost a myth and couldn't hold a man-sized blue-jacket's attention for half an hour a week. What then—the Y. M. C. A.? Yes, to some extent, but even those faithful workers couldn't solve the problem. Active amusement the men wanted, excitement, thrills, anything to take their minds off their work for a few hours several times a week when they went ashore.

Obviously there was but one answer to the question and that was the healthful recreation of organized, competitive athletics. Athletics of all sorts and forms, teams organized on each ship, and an officially recognized and governed organization to direct the activities of the entire squadron. Spirited competition and clean sportsmanship was to be the keynote of the movement, with one directing head, under the supervision of the Squadron Commander.

The official "season" was formally opened on July 4, at both bases, with eight teams competing. The initial success was most gratifying. The spirit shown by the townspeople gave the day all the ear-marks of a regular league opening in the states. The games were closely contested and the players, cheered on by the rooting of hundreds of loyal "fans," displayed an excellent brand of ball. Business houses had declared a holiday in honor of our Independence Day and apparently the natives decided to attend the festivities in a body, for at Inverness more than three thousand of them were present, eagerly attempting to learn the intricacies of the game.

From then on, the success of athletics in the squadron was assured. When the ships were in port and the weather permitted, not a day passed without one or more games played. Each team was loyally supported by its own ship's company, even the officers forgetting their dignity long enough to root long and loudly. In these demonstrations the men were moderate, considerate of the neighbors, realizing that local custom did not favor such noise, though indulged now with perfect good humor, since we appeared to need it.



ARRANGEMENT OF MINE TRACKS, ELEVATORS, AND TURNTABLES, IN "ROANOKE" CLASS OF MINELAYERS.

Athletic activities were not confined to baseball. Boat-racing, track, tug-of-war teams, boxing and wrestling, were all taken up and encouraged. On July 4, the entire morning was given over to boat racing. Excellent time was made over the mile course and good seamanlike qualities were displayed. The afternoon track events developed into a spirited contest, in which the marks made would have done justice to any first-class American university. Again on Labor Day a similar athletic meet was arranged and once more the same measure of success was attained, thousands of townspeople in attendance.

Boxing and wrestling were taken up by the individual ships and, generally speaking, one evening each week was given over to "happy hours," for bouts in the ring and on the mat. Ambitious youngsters would send forth bristling challenges, which were immediately snapped up by rivals in other ships and the resulting encounter was the equivalent—seldom bloodless—of a naval engagement in building up *esprit de corps.*

Excellent golf courses and tennis courts lay convenient to both bases, and many a day the Squadron Commander returned from the Nigg links with 18 officers crowding the barge. The squadron surgeon, Dr. Rhoades, secured many recruits for the ancient and honorable game, with the result that upward of 50 officers out of 200 entered the tournament played in September.

From the start the good effect on the men was noticeable. A consistently winning baseball team made that ship's company the envy of all others, and fostered a spirit that could not confine itself to athletics alone but was injected into drills, mining excursions and all forms of ship's work. Indeed, it would not be overshooting the mark to state that the success of the operation as a whole was due in large part to the spirit of enthusiasm aroused among the men by organized competitive athletics.

The men and officers were benefited from a mental and moral, as well as physical, standpoint. They had something really interesting to go to see on shore and to talk about on returning aboard. Their minds were taken absolutely away from war while the games were in progress, their nerves relaxed and the tension removed. Their activities were directed into healthful channels, whereas, thrown upon their own resources, they might have sought amusement in some harmful form.

Not only did athletics benefit the men, it also played its part from an international aspect, especially baseball. Essentially an American sport, it typifies everything American—rapid thinking, quickness of action, and purely American individualism, coupled with the keenest alertness in teamwork. These traits the British admire in the "Yanks." At any of our baseball games, hundreds of British soldiers and sailors could always be seen, wearing broad grins of appreciation and admiration of the cleverness of their comrades in arms. So much were they taken up with the sport that on some British ships they began to organize baseball teams, with the hope in the near future to compete with their American cousins. And the small boys in the towns were quick to take up playing ball with a stick and an old string ball. All this helped in creating a spirit of cooperation and good feeling between the British and the Americans, so important to both present and future common aims.

CHAPTER TEN

THE SQUADRON COMPLETE

After a conference with the commanding officers with the various incidents of the first excursion fresh in mind, revised instructions applying equally to every excursion were drawn up, to be supplemented by the particulars for each successive occasion issued at the appropriate time. The term excursion met with ready adoption, for its cheerful suggestion of a return—weary no doubt, but content.

A navigation memorandum of the intended courses, speeds, and principal incidents, for the information of the escort leader and each ship, accompanied the excursion order. An excellent understanding, as well as good feeling, grew up between the squadron and its escort. The escort commander would often dine on board the *San Francisco* and discuss the coming excursion and the two bodies soon came to move as one, changing course, night or day, or changing formation, frequently with only a whistle blast—a whole excursion sometimes without any tactical signal at all between the two bodies, except for some unforeseen change of course or speed.

Preparations had begun at once for the second excursion to continue the first minefield, but change had become necessary, and a line across Area C was ordered—not, however, until *Roanoke* had been loaded with 830 mines of an adjustment not suited to the changed plan, and these remained on board 33 days, the crew living around, but keeping up cleanliness and order the same as usual. So long a period fully loaded had not been contemplated, but it showed one more thing these vessels could do when well manned and commanded.

As before, assembly was at night 30 June, and Udsire the point of final departure. The supporting force was the 6th Battle Squadron of five American battleships under Rear Admiral Hugh Rodman, U. S. N. Needless to say, every one came on deck to see our handsome battle squadron, as it filed out past Pentland Skerries and formed line, disappearing to the south-

eastward. Twice during the afternoon submarine periscopes were seen by the battleships and their destroyer screen, which opened fire and dropped depth bombs, but without known effect.

Considerable current was found near the Norwegian coast, but visibility was good until we passed to the northward of Udsire; then it became increasingly hazy. The run of the flagship, guiding, was accurately determined notwithstanding, by other marks to the northward before they too became indistinct. At 4.26 a. m., minelaying began—great care taken not to lay any mines inside Norwegian waters, yet to begin just outside them. Despite the unexpected strong current at the critical moment, the first mines were dropped within 250 yards of the intended spot, just outside the three-mile limit.

Overcast sky prevented obtaining good observations to check the run during the minelaying, and as there was no check on latitude and the current was variable, the course was changed slightly for the last third of the run, to be sure of clearing our first field, towards which we were heading. This accounts for the bend in that line on the chart. We were crossing the 150-fathom deep water which skirts the Norway coast, three large ships, *Canonicus, Canandaigua,* and *Housatonic,* led by *San Francisco,* laying 2200 mines in two rows on a line 46 miles long. In spite of repeated breaking of the distance-measuring taut wire, the speed over ground was estimated closely enough to end the line within one-half mile of the point intended, which was correct within 1 per cent.

There were again no casualties and all the mines were planted. Two ships planted 710 each in continuous strings, fully establishing the success of the mining installations. There was no longer any doubt of the ability of one of these ships to plant her entire load of 860 mines without break. All vessels returned to base ready for further duty.

The explosions of defective mines on this excursion amounted to between 4 and 5 per cent, and reports received from British trawlers watching the first minefield indicated that enough more had gone off in that field since the first day, to bring the total there up to between 5 and 6 per cent. Despite all remedy, these explosions increased in number up to the 5th excursion. Then the cause was found to be due not to unskilful, negligent, or otherwise faulty procedure in either the ships or the bases, but to lie

partly in supersensitiveness in the mines' adjustment, partly in imperfection in manufacture—inevitable in such large numbers made under prevailing industrial conditions, especially of a new design.

On June 29, just before departure on the second excursion, the minelayers *Shawmut,* Captain W. T. Cluverius, *Aroostook,* Commander J. H. Tomb, and *Saranac,* Commander Sinclair Gannon, and the repair ship *Black Hawk,* Captain R. C. Bulmer, had arrived from the United States. Uncompleted work had not delayed them like the others, but the trial runs of the *Shawmut* and *Aroostook* showed their fuel consumption to be much larger than had been estimated—no data having been available when their conversion was planned—making their fuel capacity insufficient for the passage over. Indefinite delay, until a tanker could accompany them, was averted by the captains hunting up enough oil hose to fuel the ships at sea. Their departure on June 16 took place during the German submarines' activity on the New England coast—not a favorable condition for ships just out of a navy yard. Twice during the crossing, the *Black Hawk* took the *Shawmut* and *Aroostook* in tow, to give them fuel oil. Though a new operation to all hands—likewise new ships, new crews, half a gale of wind, and oil hose twice as heavy as proper—it was done well, without mishap, and all four arrived at our bases ready for service.

The third excursion could therefore be made by the full squadron of ten. It was to continue the first minefield, and as some of our mark buoys were known to have broken adrift—we had passed two on the second excursion—the flagship's navigator, Lieut. Commander Cunningham, was sent out in the squadron tugs *Patuxent* and *Patapsco,* to verify what might remain of the buoyfield. Finding half the buoys in place, he planted two new ones as a precaution. Then he passed along both our minefields, listening for further explosions, but heard none. The necessary improvement in the buoy moorings was now made, so effectively that they could be counted on thereafter. Each ship carried four buoys on her quarters, ready to drop on the instant. One stroke of an axe, or pull on a slip would release a buoy and its 1000-lb. sinker together, the mooring wire cable being so looped up around the buoy as to pay out clear. Thus the ship had no need to reduce speed nor any fear of getting her screw foul of the buoy.

Embarking mines for the third excursion had already begun when a message came that no mines were to be placed west of zero longitude for the present, a restriction that shortened the intended line by 30 miles, quite upsetting the embarking arrangements then in progress.

Meantime, the original plan had, in London, undergone considerable modification as to the constitution of the barrage. Originally of three systems, each comprising three lines of mines—upper, middle, and lower levels—the necessity which had developed for wider spacing between mines, to avoid structural damage to neighboring mines when one was detonated—300 feet instead of 150, as originally planned—made it seem desirable to increase the number of lines of mines, so as to maintain the same density of the mine barrage as a whole. The revision aimed to increase the risk to surface passage considerably. No effective patrol being maintained along the barrage, submarines would naturally prefer the surface. The revised plan, in brief, made 10 upper level rows instead of 3, and 4 middle and 4 lower level, instead of 3 each, or a total of 18 rows instead of 9.

Rather than shorten our line and again employ only part of the squadron, the Commander of the Mine Force took up the revised scheme at once, ordering 5400 mines prepared, for a field of 5 parallel lines 54 miles long. All 10 ships were loaded nearly to full capacity, *Housatonic* taking 840 mines. Departure was taken at 2 p. m., Sunday 14 July, hauling down, as we got underway, the dress bunting which had been hoisted in honor of the French Bastille Day.

CHAPTER ELEVEN

TACTICS

Ten ships laden with high explosive, navigating in mine-swept channels, in submarine thoroughfares, and near minefields beyond sight of fixed marks—compactness of the minefield demanding that the layers steam as near together as safe—necessity for keeping together in fog, darkness, or submarine attack—these were the conditions governing our tactics.

Thus, the mining excursions were not merely arduous in preparation and execution. Precision and quickness of action while at sea were imperative, from start to finish. To foster these, a steady tension was kept up throughout the squadron, a tension which likewise helped the individual ships to maintain a careful habit among the men, without making them jumpy or fearful. To sustain attention and prevent over-confidence growing with familiarity, unremitting pains were exercised to note and correct any irregularity or apparent slackness—not to find fault but to keep things taut everywhere. Only in this way could compliance with all details be insured—so very important in our work.

From assembly at the buoy until the return to it after the excursion, the *San Francisco,* leading the squadron, would maintain a steady pace, sometimes increasing to make up for adverse current, but rarely slackening speed for anything. The squadron's position was frequently compared with the time schedule, and no effort was spared to carry through the excursion with precision. There was time enough, we had speed enough, but none too much of either, and the whole body felt a constant urge towards a direct and clean-cut movement out to the field, over it, and back to the base.

Stretched in two mile-long columns while in mine-searched waters, which were comparatively narrow, the formation would widen and shorten upon reaching the 50-fathom line, so as to diminish the depth of the target offered to a submarine. Approaching the mine start point, the vessels would take the relative positions which they would occupy when the mining was begun—not too soon, because such a formation was unwieldy, and if

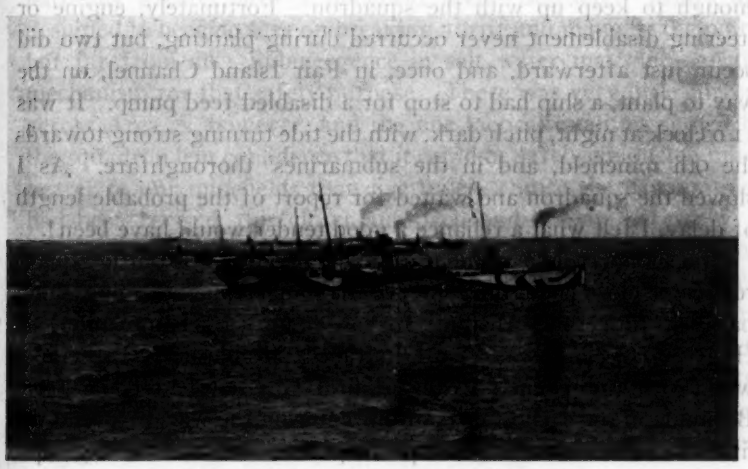
maneuvering into position involved much turning, the formation would become disordered. The 10 vessels were of 5 different types, with different handling qualities and having very small speed reserve with which to regain lost position. On the other hand, the change had to be made early enough for all vessels to get settled in station, at standard speed, before the minelaying began.

As the planting progressed, we had to make use of large, lighted, navigation buoys, planted in the open sea, obviously for our use. The British had warned us, from their own experience, of the enemy's habit of moving all such buoys whenever seen, or planting mines near them—sometimes doing both. Working far away from the nearest landmark, we would pass close to these buoys in order to determine the position of the mine start point accurately. Against enemy mines which might be around the buoys, our paravanes were counted upon for protection, but here came in a complication. While paravanes would protect against ordinary mines, they actually increased the risk from any of our own mines which they might touch. To keep the paravanes out until after clearing the buoy, then take them in before approaching one of our fields, would have been simple enough, but for the necessity of maintaining steady speed and course from the buoy to the mining start point, which precluded slowing down to take the paravanes in. Since the risk could be measured from our own mines but not from the enemy's, the paravanes were always kept in use.

Pressure of time and division of the ships between two bases while in port limited the tactical training of the squadron to what could be done while crossing the Atlantic and while going to and from the minefields. The special equipment to facilitate accurate station keeping which is usually found in men-of-war was lacking in these ex-merchant vessels. They had comparatively small rudders, and the nice regulation of steam to the engines, necessary for steady steaming in company, was very difficult with their deficient means for that purpose. Moreover, on the first excursion by the complete squadron of 10 vessels, 4 of them took part for the first time. The excellent performance of the squadron as a whole was all the more remarkable.

Passing through the mark buoys, which the sloop H. M. S. *Laburnum* pointed out, the squadron, formed in three lines abreast,

stood on beyond, to allow distance in which to steady down on the reverse course, then turned ships 90 degrees right together, by divisions in succession. This evolution formed the squadron in a single column which steered about SSW, until within two miles of the previous minefield. Two of the 10 vessels were on the right flank, so that a second, simultaneous turn, ships right, brought the squadron into the planting formation, consisting of a line of 8 ships abreast, stretching a mile and three-quarters, the remaining two in an advance line, 500 yards ahead, with three



THE SQUADRON IN MINELAYING FORMATION.

Two Ships of British Minelaying Squadron in the Left Background.

miles still to go, allowing 15 minutes time in which to settle down, before the order to begin planting. The execution of the operation was seamanlike to a degree, and the alignment, distance keeping, and handling of the vessels, in approaching and on the planting line, were excellent throughout.

It would have widened the field unnecessarily to dispose all 10 ships abreast. The advanced ships would ease back into the main line as soon as two of the 8 ships directly astern had finished their minelaying and speeded ahead, leaving vacancies. Ample time was allowed to do this slowly, before their time came to plant, so as to avoid the extra demand on their engines which might be caused by dropping back too fast. The ships were neither new nor decrepit, but there was no excuse for taking unnecessary

chances of spoiling a good performance by the squadron as a whole. Steady steaming and steering were important for safety—as well as for regularity of the mine-spacing. God help a ship whose engine broke down or rudder jammed during the mine-laying! With a strong head wind, she would drift into the mine-field, before even a destroyer could tow her clear. It was partly for such an emergency that the sweepers originally included with our force were wanted—powerful, handy, seagoing tugs, able to assist in any circumstances. The tugs that we had were not fast enough to keep up with the squadron. Fortunately, engine or steering disablement never occurred during planting, but two did occur just afterward, and once, in Fair Island Channel, on the way to plant, a ship had to stop for a disabled feed pump. It was 11 o'clock at night, pitch dark, with the tide turning strong towards the 9th minefield, and in the submarines' thoroughfare. As I slowed the squadron and waited for report of the probable length of delay, I felt what a reliance a good tender would have been!

The support force on the third excursion, the 4th Battle Squadron, came close enough to observe the minelaying, steaming along parallel, four miles distant, for an hour. Its commander, in H. M. S. *Hercules,* was Vice Admiral Sir Montague E. Browning, who, with the French Rear Admiral Grasset, had come from Bermuda in the earliest days of our entering the war, to attend the first conference on our naval participation, and as their flagships, H. M. S. *Leviathan* and the *Jeanne d'Arc,* stood in to Hampton Roads, the *San Francisco* had been the vessel to salute their flags. Now, in the same ship, it was a pleasure to lead a large, new mine squadron, performing so creditably before such an observer, the more so as Admiral Browning had sent a special message of welcome upon our arrival from America.

After this excursion was over and all the reports were in from the several ships, showing that all mines had been planted, with no mishaps of any kind, and that the vessels were ready to undertake another excursion, the following signal was sent:

The squadron commander extends sincere congratulations upon the completion of to-day's mining operation by the whole squadron. It was a handsome performance that would have done credit to a squadron of long experience. The squadron commander, the captains, the officers, and every man may rightly feel deep pride in having earned a success worthy of our navy's best traditions. 7.45 p. m., 15 July, 1918.

CHAPTER TWELVE

SOME INCIDENTS

By consensus of opinion, the limit of safe approach to a minefield in the open sea was five miles. Where appreciable current exists, a heavy sea may cause mines to step along, or "migrate"—there is no telling how far—and the danger from mines adrift is naturally greater near a minefield than elsewhere. Mines are designed to become safe on breaking adrift and many of them are, but far from all. Submergence in salt water may derange the mechanism for that safety purpose. There was very little current across Area A, however, and the fine tactical qualities shown by the squadron lent confidence that it could be safely conducted much nearer to our minefields than five miles. Since the barrage plan had been revised, this closer approach had become necessary, if we were to get the whole barrage in between the southernmost line, already laid, and the northern limit, which had been publicly proclaimed. There was some aversion to proclaiming a new limit and we had no mind to say it was necessary. So, instead of lapping the ends of adjacent minefields, the practice was adopted of "butting" the new field close to the end of its neighbor, thus continuing the same line with only a small gap between adjacent ends.

Our first news of damage inflicted on the enemy came in mid-July, soon after the second excursion, though the barrier was then hardly more than begun. The information was authentic but not very circumstantial—the standing policy was against that. Four submarines were mentioned. One of them lost nearly all her fuel and called by wireless for help, so loudly that it was overheard and a British force was sent out to capture or destroy her—but too late. Another German submarine had come to her aid, and the two got safely back. Further details are lacking.

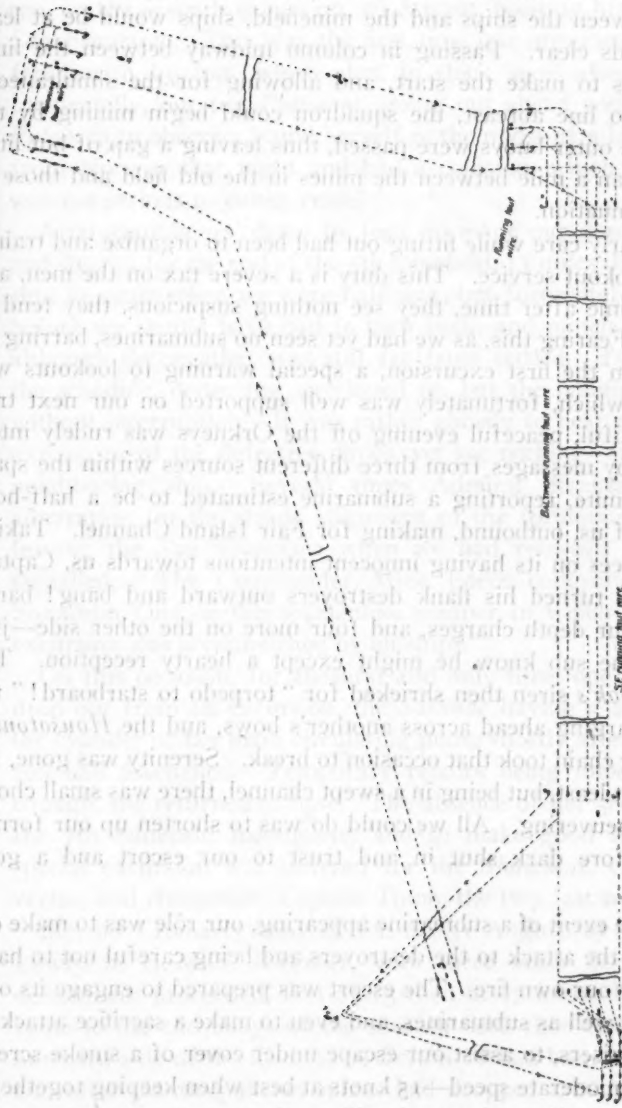
The third excursion, together with the British minefields in Area C, completed the equivalent of one system, extending from the Norway coast as far west as 0 degrees longitude. The prohibition against laying any mines farther westward than that was still in force—although the enemy submarines had changed their

route so as to pass clear to the westward of the partial barrier. So our fourth excursion began a second " system," parallel to and five miles distant from the first.

Leaving the bases during the night of 28 July, and taking final departure from Buoy No. 2, which marked the north end of the division between Areas A and C, we ran south, clearing the ends of three British deep minefields by three miles—quite safe to do if they were all in their intended places. Then, by an " isodromic " maneuver—not easy and little favored, on account of the precision that is requisite, but necessary on this occasion—our three columns, with *San Francisco* making a fourth on the left, formed a single line to the right, of eight ships, with two more in an advanced line, all steering about WSW. Being on the outside of the turn, the old *San Francisco* had to spring from 12 to 16½ knots within a few minutes, to gain her station on the southern flank in time, but no parade ground evolution could have been done more smoothly, and the quickness with which all ships steadied into accurate distance and bearing showed that, in future, the steadying interval could be safely reduced. Originally a half hour, it was cut down to 75 seconds.

Commander Moir, a new escort leader, in H. M. S. *Valhalla,* smiled slightly as he read over the mining order for the first time and I asked whether it were about this isodromic movement. He replied, No; he was wondering how they could execute one of the intermediate changes which the order prescribed to be made en route, to sort the ships out from the assembling order to the arrangement which they would be in preparatory to swinging into minelaying formation. It did look mixed at first glance, there was no denying, but I said, " Watch them do it, the Rules of the Road will govern "—and when the time came, I felt quite willing for any one to be a witness.

At the end of a minefield, the wing and the center ships simultaneously would drop mark buoys, 250 yards from the last mines, and again one mile farther on, making in all six buoys in two lines. When we came back after 10 days or so, to continue that field, a destroyer would go well ahead, to sight and stand by the outermost buoy, and the flagship would lead for it, but not steer towards the minefield side of it until the inner line of buoys had been sighted—those which were only 250 yards from the mines. The outer buoys were regarded with suspicion until some of the



APPROACHING AND LAYING THE FOURTH MINE FIELD.
Excursion 4: Formations Before, During, and After Planting.

inner ones were seen to be in place. It was then deemed safe to lead between the two lines of buoys, for as long as there were any between the ships and the minefield, ships would be at least 250 yards clear. Passing in column midway between the lines of buoys to make the start, and allowing for the simultaneous turn into line abreast, the squadron could begin mining by the time the outer buoys were passed, thus leaving a gap of but little more than a mile between the mines in the old field and those in its continuation.

An early care while fitting out had been to organize and train a good lookout service. This duty is a severe tax on the men, and when, time after time, they see nothing suspicious, they tend to relax. Fearing this, as we had yet seen no submarines, barring an alarm on the first excursion, a special warning to lookouts was issued, which, fortunately was well supported on our next trip. A beautiful, peaceful evening off the Orkneys was rudely interrupted by messages from three different sources within the space of a minute, reporting a submarine estimated to be a half-hour ahead of us, outbound, making for Fair Island Channel. Taking no chances on its having innocent intentions towards us, Captain Godfrey turned his flank destroyers outward and bang! bang! went four depth charges, and four more on the other side—just to let the sub know he might except a hearty reception. The *Aroostook's* siren then shrieked for "torpedo to starboard!" the ship charging ahead across another's bows, and the *Housatonic's* steering chain took that occasion to break. Serenity was gone, for a time at least, but being in a swept channel, there was small choice for maneuvering. All we could do was to shorten up our formation before dark shut in and trust to our escort and a good lookout.

In the event of a submarine appearing, our rôle was to make off, leaving the attack to the destroyers and being careful not to harm them by our own fire. The escort was prepared to engage its own kind, as well as submarines, and even to make a sacrifice attack on light cruisers, to assist our escape under cover of a smoke screen, but our moderate speed—15 knots at best when keeping together—and the small number and caliber of our guns, made us rather helpless against an enemy cruiser's long-range, 6-inch gunfire and high speed.

Upon returning from an Allied conference in Malta on mining the Mediterranean, Rear Admiral Strauss came out with the squadron, on the seventh excursion, 26 August, hoisting his flag in the *San Francisco*. This was the first time our program was interfered with by fog, which shut in thick soon after assembly. Incidentally, our tug *Patuxent*, going out ahead with her sister *Patapsco* to observe, found herself in the midst of a large convoy from Norway that night and had a collision, which fortunately was not serious to either vessel.

After four hours' delay by fog, we made our departure buoy and steered for the end of the 5th minefield, 13 miles distant. Fog shut in again when we were half way, but fortunately lifted just before we should have had to turn back, and minelaying began, although the weather was still far from settled. Twice during the schedule, dense fog enveloped us, but the planting went on without interruption. It was rather ghostly to hear and feel the explosions of the defective mines, yet see nothing—not even the neighboring ship. Several times Admiral Strauss expressed admiration for the steady alignment of the formation, and upon leaving the *San Francisco* when we had returned to port, he signalled, "The Commander Mine Force congratulates Mine Squadron One on the seamanlike manner in which the seventh excursion was accomplished by all ships."

On this occasion, for the first and only time, one ship had to drop out from an excursion, the *Saranac* having a smash inside the cylinder of her main circulating pump shortly after the squadron had assembled. Temporary repairs being impossible soon enough, she returned to base. The absence of her 580 mines left the 7th minefield incomplete, and to make good the defect a special excursion was ordered for the *Shawmut*, Captain Cluverius, and *Aroostook*, Captain Tomb, the two fast minelayers.

Met off Cromarty buoy at 6 a. m., 31 August, by Commander Lowry in H. M. S. *Wrestler*, with three other destroyers, the detachment proceeded, first at 15 then at 17 knots, by the usual route to the end buoys of the seventh field, then close along the northern side of the field. The *Baltimore* had been on that flank, and after planting all her mines had dropped a buoy and again, at about 9-mile intervals, two other buoys, while steaming 500 yards abeam of the nearest planting vessel. A fresh breeze was now blowing, making the buoys none too easy to pick up. Fog

had prevailed while the *Baltimore* was dropping the buoys, making uncertainty as to their position and also as to whether they were there at all. Accordingly, the detachment first ran parallel to the minefield, from 1000 to 2000 yards outside the line of buoys, so as to sight them all; then it turned back and began planting, *Shawmut* first. The mines were laid in one line averaging 600 yards outside the line of buoys, or about 1100 yards from the nearest line of mines, thus completing the original field neatly without wasting space. The mining installations of these fast ships worked as well at 17 knots as they had at 12, and altogether the excursion gave the two a good try out. They were back in their berths 26 hours after leaving them, in ample time to embark their mines for the squadron's next excursion, and with a record to their credit for laying 580 mines on the closest parallel to a deep-sea minefield that had ever been run.

CHAPTER THIRTEEN

SIGNALS

Signals had come well to the front in the course of the first excursions, not only for tactics but also for assembling data quickly, so that a fairly comprehensive report of the excursion might go to headquarters by the first boat to shore after arrival. Spelling out messages by Morse or semaphore proved too slow and inaccurate for reports from nine ships in one afternoon, often in hazy weather, so a collection of phrases, and questions to be answered by reference number, was established, to be signaled by hoists of flags.

As we had expected to use the British signal system, a special training class was formed at Newport in January, while the minelayers were fitting out. In consequence, from first falling in with British destroyers, the *San Francisco* communicated easily, and British flags could be used on the first excursion. But neither the British system nor our own was found to suit our needs, and to combine British flags with American meanings made a risk of misinterpretation at a critical time. So the American flags were restored to use and the British ones discontinued, except a few retained by each ship for calls and other routine uses, while the flagship kept a full set, for communicating with the escort by the British code. A new system, embodying several of the British features, was devised, mainly by Lieut. Commander E. S. R. Brandt, then flag lieutenant, and was put into effect on the second excursion. The main feature was that the meaning of tactical signals—those which required immediate action, affecting the ships' movements—was self-evident to anyone who knew the names of the flags.

Flags and associations already familiar having been utilized, the signalmen quickly learned. Separation among three anchorages prevented signal practice by the squadron as a whole in port, but drills several times daily at each anchorage and on the way out to the mining ground enabled the new code to be used on the full squadron's first trip. Great interest was evident among the signal forces of all ships. Signals were habitually hoisted only

just long enough, as determined by experience, for the average vessel to repeat the hoist. Competition became keen not to be the cause of delay, and very soon the signaling attained an accuracy, rapidity, and style comparing favorably with the best performance of any type of vessel. Once or twice the *Quinnebaug*—whose mast was not high—beat the flagship in getting her own signal up to the yardarm. Less than a minute by day, and often only 30 seconds, would suffice between giving an order for a tactical signal and beginning its execution by the squadron—without a glance at a key book or card at either end. Most efficient telephone service would hardly equal that.

The *Vampire* soon picked up our new system, so that signals to her could frequently be dispensed with. Upon one of ours going up, the corresponding British signal on *Vampire* would be seen in a few moments.

Accuracy of transmission and of record being very important where so much was done by signal, these were stimulated by daily comparison of the signal records of all ships. A " discrepancy " sheet was compiled, to show the errors and omissions of each ship for the previous day, and directly after each excursion, the signal officers would meet, to compare the signal records of the trip. A further check was kept by a staff officer being constantly on watch on board the *San Francisco* when at sea, taking notes upon incidents and errors in signals, station-keeping, and the behavior of ships. The Recording Angel could not have been more observant. I would edit the rough record at the end of a watch, references to the pertinent instructions were entered, and a smooth " Discrepancy Report " was sent to all ships at the end of the excursion, as a reminder of their sins.

Had the signal officers been regulars and but one system of signals been in use from the beginning, the high standard maintained would have been commendable. The attainment of such a standard by inexperienced personnel, adopting a new system on very short notice, was highly creditable to all concerned. Especially should there be mention of Chief Quartermaster William H. Kerins, of the *San Francisco,* and the other chiefs, whose training and management of their signalmen and whose own skill and fidelity made our quick and accurate communication possible.

CHAPTER FOURTEEN

THE BARRIER ACROSS

The barrage began to show results early in July, after our second excursion, although not yet half across. The enemy submarines changed their route then, so as to go through Fair Island Channel, south instead of north of the Shetlands. Thus they would pass west of the partial barrage, through the 60-mile wide passage still open. The fact of Area A having been proclaimed gave ample warning, and even the enemy could not complain of being ambushed, if he sustained damage there. Advertising a minefield two months in advance was certainly fair play. But now came the mining of Area B, which would carry the barrier clear across the last 45 miles of the 230-mile stretch. This was not published, but the enemy might have assumed that it would be done sooner or later.

A joint excursion by the two squadrons was arranged, Rear Admiral Strauss commanding the whole, flying his flag on board *San Francisco* again. The squadrons joined off the middle Orkneys the morning of 7 September, and began the minelaying a few miles to the northward, starting from a buoy placed by H. M. S. *Laburnum* and removed by her after we had passed. As we were directly in the submarines' thoroughfare, special patrols were provided, surface and air, in Fair Island Channel and also well to the southward of us. The American squadron planted six upper level lines, the British squadron planted one similar line, after the completion of which it separated to the southward, returning to its base at Grangemouth, Firth of Forth. On the way, one of them had a collision in the fog with a destroyer of its escort, which later sank in consequence.

Our squadron turned north at the end of our minefield, ran taut wire to Buoy No. 5, thence paralleled the minefield at five miles distance for observation of defective mine explosions, steering west to the Orkneys and returning to the base on the reverse of the outbound courses. Fog came on soon after mining was finished, continuing intermittently until we made port. For this reason, *San Francisco* did not cut her taut wire at Buoy 5 but kept

it running until the squadron slowed to take in paravanes, near Cromarty—122 miles of wire run out, without a break.

The succeeding excursion was similar, with Rear Admiral L. Clinton-Baker, R. N., in H. M. S. *Princess Margaret,* in command of the whole force, Rear Admiral Strauss again on board *San Francisco.* On the way out, it was not permitted to pass between the Orkneys and the western end of the minefield planted just previously, but instead, the squadrons were routed NW'ly, through Stronsay and Westray Firths, in the Orkneys, thence E'ly through Fair Island Channel, and down to within five miles north of the other minefield.

While standing through Stronsay Firth in a long, single column, the British squadron, which was in the lead, opened fire on its starboard quarter, its escorting destroyers gathering to drop bombs about a certain spot. Upon signal from the *Princess Margaret,* the starboard wing destroyers of our escort speeded ahead to join the attack, but the port wing destroyers remained on station, although the leading squadron's destroyers had left theirs. In a few moments, a submarine broached about 1500 yards, two points on *San Francisco's* starboard bow, heading across to port, through the column, between the two squadrons. Some destroyers followed and continued bombing. Smoke screens were laid by our escort (*Vampire,* Captain Godfrey, and 11 others of 14th Flotilla) and by our own ships, which thus had a good test for their smoke outfits. *Roanoke* chanced to have a steering engine disablement just at this moment, causing her to sheer out and shift to hand gear, and the *Housatonic* also had some steering trouble, but there was no mishap, and the submarine also for the time escaped. By good luck, an official photographer happened to be on board *San Francisco,* and he got some pictures of genuine activity.

A delay at the morning rendezvous, the long distance round about, and adverse current combined to make a late mining start. While the mining was in progress, the bodies of two German sailors were passed, and a heavy explosion was observed in the eighth minefield, five miles distant, in a position that plotted in the same place a submarine would be which had been reported shortly before.

Darkness shut in about an hour before planting was completed but it caused no suspension nor interference. At the end of the field, buoys were dropped as usual, and all ships together turned

left, without signal but on orders given before dark, to the course north, then formed in two columns for the run home. The British and American squadrons had now separated and they passed back through Westray Firth in succession after daylight next morning. Off Pentland Skerries a suspicious craft ahead caused another submarine alarm, and the escort again enveloped the squadron in a smoke screen, but the alarm proved false.

This time, the 10 American vessels had planted six lines, two at each of the usual levels, 46 miles long, 5520 mines in all, the maximum of any excursion; the 4 British vessels planted one line at deep level, 1300 mines, 32 miles long, making altogether 6820 mines on the excursion, the largest single minefield ever planted—done in 3 hours and 50 minutes. Upon returning to the bases, Admiral Strauss signaled "The Commander Mine Force congratulates the squadron on this biggest and most successful excursion."

CHAPTER FIFTEEN

FINISHING THE BARRIER

The conference at Malta at which Rear Admiral Strauss was the American representative recommended extensive mine barrages in the Mediterranean, in locations where the depths of water were much greater than any yet mined, involving winter operations for us. As a first step, Captain Murfin was sent down to Bizerta, near Tunis, to establish a base there, like his two in Scotland—though under much less favorable conditions. Considerable experimenting at home was likewise involved, to develop a suitable extra-deep mine and its moorings. Experienced personnel being needed for this, orders came placing the *Baltimore* at disposition of our Naval Bureau of Ordnance for the purpose. Accordingly, on the tenth excursion, 26 September, she parted company off Scapa Flow, sailing thence two days later for home. In the nine other ships, 97 per cent of the mine capacity remained, but as an experienced vessel of regular man-of-war type, the *Baltimore's* value in the squadron had far exceeded her proportionate capacity.

The minelaying squadrons were now doubling and trebling the barrage, which had been carried clear across the North Sea on the eighth excursion, 7 September. Hitherto we had been favored by good weather, but the season of frequent storms was approaching and already the lengthening hours of darkness made a considerable difference.

Our one loss of life at sea occurred just as the *Baltimore* left us. The *Saranac's* port paravane was running badly and, in clearing it, George C. Anderson, chief boatswain's mate, stepped out on the davit—a sudden jerk! and he was gone. Although search was made, he was never seen again. He had been an energetic yet safe leader, never allowing another man to go overside without a bowline around him, but of himself had been less careful.

An almost unbroken record of ten excursions carried through without breakdown or delay made such a performance now seem a matter of course. The artificer personnel of all ships made a fine showing in upkeep and in steady steaming at sea, notwithstanding that overhaul time was very limited. On returning to port, the squadron would prepare immediately for another excur-

sion and would then wait from day to day for the escort, under notice too short for the extensive overhaul desirable. As the operation progressed, making more wear and tear, the intervals between excursions became shorter and bad weather frequently necessitated keeping steam ready, in case the anchors dragged, as often they did, all which reduced the repair time. Unfinished details of conversion, hard usage in former hands, absence of spare feed pumps and similar secondary dependencies, and a large amount of auxiliary machinery for the vessels' size,—all these were work-making factors. Yet, except for wear, the general condition of all machinery steadily improved.

A large amount of self-repair was done, the *Roanoke* being almost wholly self-sustaining, resorting very little even to our own repair ship *Black Hawk*. The *San Francisco's* carpenter gang built an excellent emergency cabin under the bridge in about 10 days. Then the *Shawmut* and *Aroostook* by themselves increased their oil fuel capacity by 50 per cent, which later enabled them to make the run homeward unassisted and unescorted.

Procedure in conducting the squadron aimed at steadiness in steaming and steering. No unnecessary chances were taken, but neither was the treatment tender. The ships always worked near their speed limit, with only the reserve needed for tactical reasons. Their good performance was due to careful, intelligent foresight, and the rarity of even minor disablements is proof of noteworthy ability and fidelity on the part of the engine and fireroom personnel. No ship was ever late, no minelaying operation ever interrupted, only one hot bearing occurred, only once did a ship's engine have to stop—for but a few minutes—in 8400 miles steaming.

As for steady station-keeping, some ships, notably *Canandaigua*, were always there—hour after hour, night and day—and the others were seldom out. Approaching and during the minelaying, they were very accurate. As one visiting officer from the fleet said, "You've got it on the battleships," and it was officially reported by Admiral Mayo that

> The minelayers, though of diverse types, maneuvered well together and kept station very well indeed; they appeared to be under excellent control, both individually and as units, at all times. The laying operation which was witnessed was carried out according to plan without hitch of any kind, thus indicating the efficacy of the preparation, including planning, and the thorough understanding of the work by all concerned.

Much official interest was taken in our operation and brief visits to the bases and the ships were made during the summer by Vice Admiral Sims, Admiral Sir Rosslyn Wemyss, the British First Sea Lord, Vice Admiral Ommaney of the Admiralty, Rear Admiral Clinton-Baker, R. N., the House of Representatives' Naval Committee, and Assistant Secretary Franklin D. Roosevelt. Several of our naval officers went out on excursions, and Lieut. Commander DeSalis, R. N., always a welcome, enthusiastic supporter, went on several of them. They all admired the orderly, complete, and ample arrangements of the mine assembling bases and were especially complimentary about the new minelayers.

Officers and men felt intense pride in their ships, and spared no effort to keep them in regular man-of-war condition. The ten made a handsome squadron, and in capacity for carrying mines, in equipment for handling and planting them continuously, and general arrangement and quality, the new American minelayers were admittedly superior to any others.

Their capacity and performance was the subject of much favorable comment and careful study by the British Admiralty. Besides large mine capacity, their mine elevators were a striking feature. The very first thing considered in the plans had been how to get the lower deck mines up to the launching deck, so that a ship's entire load might be planted in one unbroken string. The Otis Elevator Company's representatives had been called in at the outset and, after several alternatives had been examined, their standard platform type was decided upon, each elevator lifting two mines every 20 seconds. Six elevators in the four largest ships, four in two others, were in use 9 months in all kinds of weather at sea. Only one of the 32 elevators ever failed, and that one just once!

The British minelayers had had trouble from the mine tracks opening and closing with the working of the ship in a seaway. In ours, the tracks were secured to steel crossties mounted on wooden bolsters, the strength and stiffness of the tie, with the elasticity of the bolster, keeping the rails true to gauge, notwithstanding they were lighter rails than the British used. Special interest was taken also in the simple, light switches used in our ships' mine tracks. Some of the Admiralty officials were hard to convince that these switches actually worked, even when operated before their eyes.

While the ships were embarking mines and coaling for the twelfth excursion, Admiral H. T. Mayo, Commander-in-Chief, Atlantic Fleet, accompanied by Captain O. P. Jackson, his Chief of Staff, Rear Admiral Strauss, and Captain N. C. Twining, Chief of Staff to Vice Admiral Sims, made an informal ship inspection, after which Rear Admiral Strauss published the following:

8 October, 1918.

Admiral Mayo, commander-in-chief, left the headquarters of the mine force yesterday evening for the south.

He expressed himself as highly pleased with the zeal, loyal cooperation and efficiency of the mine force both ashore and afloat and congratulated us on the work we have accomplished.

The commander of the mine force is unable to give any data as to the number of enemy submarines that have been destroyed as a result of our efforts, but it is practically certain that the toll is considerable.

The commander-in-chief emphasized the part that the mine force is taking against the enemy as a distinct military offensive, thoroughly known and appreciated at home.

Admiral Mayo found things in their normal condition, with no preparation made for him, as some ships were coaling, others embarking mines. He was evidently pleased with all that he saw, and he remarked how fortunate it was that we had been training in that kind of work, in the old, small mine force, for two years past.

Bad weather during some part of an excursion became now the rule. Coming through a narrow passage in Westray Firth one morning, strong tide against a strong wind made an ugly cross sea, knocking us down to eight knots. One destroyer broached to, and for a few moments lay between our columns, wallowing heavily, as if the next roll would surely take her under.

Shortly afterwards, one arm of the *Quinnebaug*'s rudder quadrant broke, and the other arm bent almost to the point of fracture. Had it too gone, she could not have escaped wreck on the rocky channel side. Fortunately she was able to gain partial shelter; in two hours she made repairs and, taking after the rest at top speed, she arrived at Invergordon only 45 minutes behind them. As a coastwise merchant liner, she was often behind time, but in naval hands she developed speed to spare, frequently maintaining on natural draft 10 per cent more than her former best speed under forced draft.

Passing mines adrift was a frequent occurrence. Occasionally we would have to turn out for them. If of the moored type

originally, broken away from their anchors, they should be safe when drifting. But of course safety devices, like all others, not infrequently fail to function, especially after immersion in sea water. We let the mines alone, but occasionally an escort destroyer would fire a few rounds, to sink them.

A German floating mine, upon one occasion, was sighted nearly ahead by the *Quinnebaug*, at a moment when her port paravane, running foul, had been hauled in, to clear it. Thrown overboard bodily, the paravane fell on its back, and fortunately righting itself, came in contact with the floating mine, which apparently had a mooring line attached to it, and towed it along with the ship for probably 30 seconds—when the mine detached itself and floated astern. While this was going on on deck, a fire broke out below, in the midst of the mines on the stowage deck. The ship's cooks, who were in the galley at work, with the greatest promptness seized hand fire extinguishers, climbed over between the mines and extinguished the flames. The *Quinnebaug* started planting within two minutes after this danger was averted.

How such a fire would have spread in one of these ships, so full of woodwork, was shown on board the sister ship, *Saranac*, after our return, in January, 1919, at Hampton Roads. The very night after discharging her mines a fire broke out, spreading with such rapidity that the sleeping officers had to escape in their night clothes, losing all their effects, and the men in the engine room were barely able to attend the pumps without suffocation.

The longest single minefield on record was the twelfth, laid on 13 October,—first an 8½ mile stretch 5 lines wide, then 65 miles 3 lines wide, 73½ miles in all. It was begun at 7.33 a. m. and finished at 2.52, over 7 hours. In the latter part, we ran closer than usual to the adjacent field, to keep inside the proclaimed barrage limits. That night, steaming at easy speed so as not to make the entrance to Westray Firth before daylight, radio orders were received from the Commander-in-Chief, Grand Fleet, about 11 o'clock, to proceed with despatch into Westray Firth. Other messages were intercepted, indicating that enemy vessels were out, and as we passed Pentland Skerries next forenoon an unusually large number of British destroyers and sweepers and an observation balloon were searching that vicinity for mines and submarines. Quiet was returning, after a night of greater activity than for a long time.

(TO BE CONTINUED)

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ASTRONOMICAL OBSERVATIONS MADE AT LOW ALTITUDES AS AN AID TO NAVIGATION

By GEORGE C. COMSTOCK

In discussing the uncertainty affecting the atmospheric refraction at low altitudes Bowditch, Ed. 1917, Art. 298, sets forth that "under certain conditions of the atmosphere a very extraordinary deflection occurs in rays of light which reach the observer's eye from low altitudes . . . . . the amount of which is not covered by the ordinary corrections for temperature and pressure. The error thus created is described under Dip (Art. 301); on account of it altitudes less than 10° should be avoided." There follows under Art. 301 the statement that "reliable observations have frequently placed this error above 10′ and values as high as 32′ have been recorded."

If the Dip is of uncertain amount to anything like the extent here suggested its uncertainty must affect in equal amount all altitudes measured from the sea horizon, whether they be more or less than 10°, and the precept to avoid *low* altitudes seems to be a *non sequitur* from the cause alleged. The uncertainty in the amount of the Dip correction arises from abnormal refraction suffered by the rays of light that come from the horizon to the observer and it appears to be inferred that rays coming from the sun or a star and passing near the horizon will be in like manner abnormally refracted by an additional amount comparable with that above set forth. In consequence an observation of such a body would be uncertain on account of abnormal refraction of its own light in addition to abnormal refraction of the horizon and one of these sources of error could be escaped by avoiding low altitudes.

To the writer, as an astronomer, these alleged abnormal refractions appear exaggerated, both in amount and in frequency of occurrence. At least they seem to call for evidence in their support, and as such evidence is not found in books readily accessible

I have sought to obtain it from observations, *e. g.*, risings and settings of celestial bodies observed at the sea horizon under conditions that will permit a determination of the amount of refraction actually present and its comparison with the corresponding amounts furnished by the refraction theory and tables. I have been unable to find suitable published material of this kind, although it doubtless exists, and a considerable amount of inquiry for unpublished material has brought only one return, viz., an excellent series of 27 observations of the time of sunset made at Key West between January 10 and April 16, 1911, by Captain E. E. Hayden, U. S. N. These observations were kindly placed at my disposal by the Hydrographic Office.

The physical conditions under which these observations were made are distinctly favorable to the occurrence of abnormal refraction, since, owing to the sun's change in declination, the observations were made over fairly deep water (the Gulf Stream) during January, while later the horizon behind which the sun set lay over extensive coral reefs covered by shallow water. While the refraction tables take no account of such circumstances, theory indicates that the actual refractions should be larger in the early part and smaller in the latter part of this series of observations than the tabular values, even when corrected for temperature. The observed facts are in agreement with theory.

I have used each observed time of sunset in the Key West series to compute the actual amount of refraction suffered by the sun's disappearing edge and I have compared this result with the corresponding value computed directly from Radau's theory of the refraction (*Annales, Observatoire de Paris, Tome* 19) since this appears to me the best theory available at this time. It is certainly much better than Bessel's theory, which is employed in Bowditch, although under ordinary conditions the numerical results of the two theories are not very different. I have not used for this purpose the numerical tables given by Radau, but have computed values directly from the differential equation for the refraction, taking into account the division of the atmosphere into troposphere and stratosphere and the observed temperature gradients established by the meteorologists subsequent to Radau's work. The results of the comparison between fact and theory may be arranged as follows:

I. In the Key West observations the average deviation of the observed from the computed refraction at the horizon, taken without regard to sign, is 2′.2.

II. These deviations are distinctly seasonal in character. When the sun sets over deep water the computed and observed refractions are in substantial agreement. When sunset is over the shallow waters of the coral reef the observed refractions are smaller than the computed ones.

III. The constant coefficients that enter into the refraction theory are based upon observations of stars made at night, and Radau indicates, *loc. cit.*, that the refraction suffered by the setting sun is probably less, under normal conditions, than that of the stars. Following this suggestion I have determined from the Key West observations themselves a mean value of the coefficient of refraction and substituting this in place of the conventional value employed above I find for the probable error of a computed horizontal refraction (supposing the observed refraction to be absolutely free from error) p. e. $= \pm 1'.0$.

IV. In any given case the actual refraction is a physical product of the air and the manner in which its density varies along the path of the ray of light in question. To examine into this distribution of density and its change from day to day, I have computed the refractions not only for the normal atmospheric conditions for sub-tropical waters, indicated by modern meteorological research, but also for two abnormal conditions lying on opposite sides of the normal state, but well within the range of observed variation from that state. One of these abnormal conditions approximates to that which results in a thunder storm, *i. e.*, the bottom stratum of the air (within two kilometers of the earth's surface) is strongly heated so that the vertical fall of temperature is very rapid, but not sufficiently rapid to result in dynamical instability of the atmosphere. The second abnormal condition is defined by a vertical temperature gradient comparable with that which obtains over a snow-clad soil at night, *i. e.*, there is a slight rise of temperature with increasing height up to a few hundred feet (inverted gradient) but this rise is kept well within the limits furnished by observation. At an assumed temperature and barometric pressure corresponding to the mean of the Key West observations, *i. e.*, 25° C. and 763 mm., the theoretical refraction

at the horizon, $h=0°$, corresponding to these three states of the atmosphere is

	$h=0°$	$h=4°$
First abnormal state	27′ 23″	11′ 2″.6
Normal state	31 10	11 2.7
Second abnormal state	36 29	11 3.2
Bowditch values	34 28	11 6.0

It appears from these numbers that the refraction at the horizon is so largely influenced by local and transitory conditions in the lower atmosphere that it may differ by ten or even twenty per cent from the mean value furnished by the tables. Since these conditions can rarely be taken into account by the observer the figures may be looked upon as furnishing a measure of the risk he runs in using an observed altitude of 0°. Nevertheless, the Key West observations show that such large deviations from the tabular amount of the refraction are the exception rather than the rule, quite like in this respect to the abnormal variations in the dip of the horizon noted in Bowditch.

With one exception all of the Key West observed refractions fall well within the limits fixed by the atmospheric conditions assumed above, and their entire range of values is sufficiently accounted for by conditions falling inside these limits. But in one case, January 12, the observed horizontal refraction is only 23′.4, which corresponds to an atmospheric gradient that should promptly result in a tornado. As no such result was noted this abnormal refraction must be attributed to some other cause, possibly to an error of twenty seconds in the observed time of sunset due to the sun's disappearance behind a distant cloud bank instead of behind the horizon.

V. The unpredictable variations in the amount of the horizontal refraction, which are found above, may well lead to caution in the use of observations made at the horizon, although at a pinch they will furnish a line of position (Sumner line) whose probable error will be approximately 2′. A more important result of this inquiry is that even large errors in the horizontal refraction, such as are found under IV, disappear very rapidly with even a slight increase in the altitude of the body observed. The last column of the table in IV shows for an altitude of 4° the computed refraction corresponding to the several states of the atmosphere that produce at the horizon the results there shown. These varia-

tions in the refraction at 4° altitude are wholly insignificant for any purpose of navigation, but it should be borne in mind that these variations arise wholly from anomalous conditions in the lowest two kilometers of the earth's atmosphere. Anomalous variations of density are found in the atmosphere up to a height of some 15 km., but their effect upon the horizontal refraction is relatively small, *e. g.*, an extreme range of 100 seconds at the horizon and 1″ or possibly 2″ at an altitude of 4°. It appears, therefore, that at so low an altitude as 4° the computed refractions are sufficiently reliable for all purposes of navigation. The Bowditch limit of 10°, below which observations should not be made, is a needless restriction upon the navigator. Particularly in the winter season when the sun cannot be observed upon the prime vertical, it may be observed, and should be observed, much lower and therefore much nearer to the prime vertical than is done under current practice.

While experience must determine the lower limit of altitude to which observations may be extended, theory would indicate that the refraction furnished by the best tables for an altitude of 2° is reliable to within a fraction of a minute.

Additional data with which to compare and control these conclusions would be very gladly received by the author. Such data should comprise the observed time of rising or setting, at the sea horizon, of any bright celestial body, supplemented with the elevation of the observer's eye above the sea, the temperature and barometric pressure of the atmosphere, and if possible the relative humidity or vapor tension. The latitude and longitude of the place of observation should be given to within a fraction of a minute. The observed times are best expressed in Greenwich mean time.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE NAVAL RESERVE

ITS ORGANIZATION, ADMINISTRATION AND TRAINING IN TIME OF PEACE.

By CAPTAIN C. L. POOR, U. S. N. R. F.

1. Upon the signing of the Treaty of Peace the department will be confronted with the question of peace organization, administration and training of the large force of naval reserves, enrolled throughout the country during the recent war. From the facts of the present war, it is evident that the navy must maintain this reserve practically up to its present strength, must organize, administer, train and recruit the same, and provide an economical and efficient method of keeping this reserve up to a high standard of mobility and efficiency.

2. It is realized that the department is making and has plans to this end and that the system now in effect can be developed efficiently. It is believed, however, that the department welcomes statements of the experiences and conclusions of officers under the present system and the writer therefore respectfully submits the following suggestions and comments for consideration and discussion by the navy and naval reserve. These are the result of thirteen years' experience in the naval militia, in all grades, from lieutenant junior grade to captain commanding the largest naval militia battalion in the United States. Prior to the beginning of the war, the writer was called to Washington to assist the naval board appointed for the formulation of General Order No. 153 and in other matters affecting the naval militia. The writer was executive secretary of the Naval Training Association, composed of those who took the civilian volunteer battleship cruise in 1916 and was organizing volunteers for subsequent cruises at the outbreak of the war. Prior to the outbreak of the war, the writer cooperated at New York in the organization of the third naval district offices. During the war the writer has been continuously

on duty in naval districts in connection with the mobilization, organization and administration of naval districts and of the reserves and has come in contact with many phases of this problem.

I. ADMINISTRATION, GENERAL

It is suggested that the entire commissioned and enlisted personnel of the reserves, should be administered at the Navy Department, in the Bureau of Navigation, by a separate division of naval reserve personnel, similar in scope, authority and organization to the former division of naval militia affairs. This division should be in charge of a line officer of the navy, not below the grade of commander, and preferably of the grade of captain. All matters pertaining to the naval reserve personnel should be handled by this division, through the commandants of the naval districts. It would have charge of all examinations, promotions, fitness reports, details of officers, records, training, assignments of officers and men for training, assignments of officers and men for training afloat and general service; and, in conjunction with the bureaus concerned; the arming and equipping of reserve units in the districts; and the assignment of vessels, officers, and men of the regular service to reserve units for instruction purposes.

II. ADMINISTRATION, DISTRICT

It is submitted that, as at present, the administration of the naval reserve throughout the country should locally remain in the hands of the district commandants, who with their local organization and officers can best and most economically handle the local units, keep them organized, equipped, and in touch with the naval service. It is submitted that, as at present, the administration of the naval reserve personnel should be the duty of the aide for personnel in each district. This officer should be a lieut. commander or commander of the regular service and should be an officer not only of skill and experience in service afloat but should be a capable instructor of officers and men and also be possessed of tact and broad-mindedness in his dealings with those with whom he comes in contact. It would be the duty of this officer to act as inspector-instructor of all the naval reserve units within the district. He would, thereby, come in contact officially and personally with officers of the reserve of varying degrees of service

and experience, and with city and state officials at various points in the district. The detail of a mediocre or uninterested officer to this duty simply because: "he wanted a shore billet," would negative much of the value that the service or the reserve would otherwise obtain from an interested, tactful, enthusiastic officer, who in this capacity acts in a sense as a *liaison* officer between the navy and naval reserve. In this connection, the writer speaks from actual experience of a number of naval inspector-instructors assigned to duty throughout the country prior to the war. Some of them inspired the militia within their charge with a fine spirit of enthusiasm and ambition to qualify usefully for service with the navy, while others were an actual drag upon organizations naturally enthusiastic and ambitious, and upon whom the effect of an apathetic, indifferent officer was positively harmful. The naval reserve, as did the naval militia, naturally look up to the officers of the regular service as an inspiration and example. If, therefore, they observe that service of an officer is evidently not up to standard, their morale is injuriously affected.

The marking, rating and disrating of men in the district, the reports on fitness of officers and the records of officers and men should be in the hands of the aide for personnel of each district, as at present. Under the direction of the commandant, this officer would organize and assign the various units within the district, for purposes of mobilization and drill, would assign such instructors of the reserve and of the regular navy as were available within the district or assigned to the district by the department for that purpose. He would arrange for the participation of individuals and units in periods of service afloat in district vessels and in practice cruises in general service as directed by the Bureau of Navigation. He would arrange for periodical examinations of candidates for commission or warrant from the enlisted personnel and for the examination of officers desiring to qualify for confirmation in Class 2 or for promotion, as approved by the department after recommendation by the commandant of the district.

The administration of discipline in connection with the reserve force or in connection with any officers or men of the navy detailed as instructors within the district would come under the cognizance of the commandant through the aide for personnel, except for infractions of discipline on board of commissioned vessels operating in the district, where the commanding officer was

authorized to act, or at regular naval stations in the district. The matter of discipline is mentioned here because it has been a difficult question in the past as regards the relation of the enlisted personnel of the navy assigned to naval militia vessels to the naval militia officers in command or on duty in connection with these vessels. Later legislation and departmental action cleared up this matter considerably and gave to naval militia officers the necessary authority to enable them to act, but it is evident that the relations between the enlisted personnel of the navy and these officers have not always been those between men and officers of the regular service, and in some cases there have been complaints on both sides, showing insubordination on one hand and tactless or arbitrary action on the other. This would be entirely avoided were these men under the control and authority of an aide for personnel of command rank of the regular service.

In matters of supply, repairs, equipment, etc., of reserve units and vessels assigned thereto, the district supply officer, the district industrial manager and other district officers would have jurisdiction, as at present in the case of district vessels. Pay accounts of officers and men on active duty in the reserve or officers and men detailed as instructors to the reserve would be carried by the district supply officer except in the case of vessels assigned to the district for training, large enough to justify a supply and disbursing officer in their complement.

III. GENERAL ORGANIZATION

It seems to the writer, that the most important matter to be considered in arranging for a general organization of the naval reserve force, is that of stimulating recruiting and maintaining interest. It is submitted that the experience of years both in the army and navy for all volunteer forces is that "local pride and local interest" are the best means to this end. The evidences to this effect in the present war are overwhelming and it has been the experience of the navy within itself that nothing contributed so much to the efficiency of a ship's company as stimulating their *esprit de corps,* to use the old term, or their "ship's loyalty," to use a newer one. The organizations in the national army, in the national guard divisions, and even in the new divisions of the regular army, have all been based on this feeling. In the present condition of the naval reserve and under its present scattering of

personnel throughout the entire country there is no incentive of this sort, but the spirit is there and only needs encouragement. It has but needed in the various districts a statement that the ——— district or ——— naval station, had to beat the other districts or other naval stations in the Liberty Loan Drive or in the standing of the officers or men it sent to Annapolis for the reserve class, to the radio school, etc., to stir up a fine feeling of enthusiasm and co-operation. This spirit should not be lost, and the only way to maintain it in a national reserve, is by organizing the reserve into local units under designated names. This is the strongest argument that the former naval militia might put forth for its restoration, and it seems an unanswerable one; for it is the spirit of local pride and emulation, of *camaraderie* and good-fellowship, that have kept the naval militia organizations and the national guard in existence and under no other conditions could the navy have had a partly trained reserve of about twelve thousand men, ready to go into service the day war was declared. A system of individual appeal to individuals throughout the country, that does not give them a name and a local organization to work and to drill under and to work for, is going to fail in the case of men who are so drilling and working voluntarily, and not as a means of livelihood, but often at the expense of the time they should give to their business and their families. The spirit of patriotism is national, but it needs "local color" to make it effective!

In accordance with the above the naval reserve force should be divided into brigades, battalions, and divisions. The reserve battalions and divisions within any naval district would compose a brigade, the number of the brigade to correspond to the number of the district. It is realized that this will make the brigade vary considerably in size, but the headquarters work of the brigade and its relations with the department can be so much better handled through the district headquarters that this irregularity could be disregarded. This would make thirteen brigades corresponding to the thirteen districts in the continental limits of the United States. Reserves in the Fourteenth district should be attached to the Twelfth district brigade, and those in the Fifteenth district to the Eighth district brigade.

Battalions would be organized at all important centers where there is sufficient personnel nearby to warrant.

Independent divisions could be organized at smaller centers or where isolated location did not permit of their attachment to a

battalion. As a general proposition the divisions of a battalion should not be located more than one hundred miles apart, so as to be within easy telephone and rail access of the battalion headquarters.

The organization of brigades and battalions should in general follow that laid down in General Order No. 153, with the following modifications:

District brigades should be commanded by captains, with staff as assigned by General Order No. 153, paragraph 50.

Battalions should be composed of not less than four divisions and not over sixteen; battalions of more than eight divisions to be commanded by a commander; battalions of eight divisions or less to be commanded by a lieut. commander. The headquarters for battalions of eight divisions or less to be as indicated in paragraphs 51 and 55 and the headquarters for battalions of more than eight companies to be as indicated in paragraph 52, necessary modifications being made to provide for petty officers of special rating, etc., created since General Order No. 153 was formulated.

The divisional organization should be as prescribed in General Order No. 153 except that the minimum number of men authorized for a division should be forty-eight, whether deck or engineer, and the maximum number ninety-six. The provisions of paragraphs 21 and 22 should be eliminated; as engineer divisions and aeronautic sections should be separate.

It is realized that this provides for thirteen reserve officers of the grade of captain, and a proportionate number of commanders and staff officers of assimilated grade who have not been specifically authorized by existing laws and regulations for the reserve. It is also realized that this feature will promote discussion and opposition by many officers in the regular service. It has been the subject of much past discussion between the naval militia and the department. To attempt to enumerate the reasons pro and con brought forward in this discussion would take more time and space than is available here. The writer as a former officer of the regular service and as an ardent believer in the federalization and centralization of the naval reserve or militia, as well as a naval militiaman of twelve years standing, has endeavored to look impartially on both sides of this question and to do justice to both; with a final conclusion that advanced rank is not only desirable but necessary for the upbuilding and efficiency of the naval re-

serve; while at the same time it works no injury or prejudice to the naval service or any individual in it. Provided, that is, that the control of promotion and assignment remain, as under present laws and regulations, entirely within the control of the department. In the past, officers of the service, realizing the grave responsibilities and personal and professional obligations and prestige attached to command rank in the navy have feared, and not without reason, that officers in the states might attain to this rank who were not worthy of it. It was entirely fitting and proper that they should be jealously watchful for the honor and dignity of the service, but under present legislation and departmental control no such unfortunate contingency should arise. If an officer proved to be incompetent or unworthy of the honor of rank conferred upon him, the department has the same control, by detail of duty and the usual disciplinary and remedial measures, that would obtain with an incompetent officer in the regular service. Another fear on the part of many of the younger officers, just approaching command rank after years of faithful service, was that they would be outranked on duty by a naval militia officer of limited service. As the matter of detail was within the control of the department, it would hardly seem that this fear was justified, and it is not believed that any case arose prior to the war or during its occurrence whereby an officer of the regular service had just cause for embarrassment or complaint in this respect. The department is the final judge of the qualifications of an officer and is always able, under the law, to transfer to Class 4 officers not qualified for command afloat, in which class these officers are strictly limited in their seniority and duties.

In further connection with the desire to safeguard the prestige of command rank, it might be stated that the officers of the reserve should be considered as officers of a separate corps of the naval service. They should be considered in the same relation as officers of the marine corps, which is also part of the naval service. It is not considered that there is any bitterness or anxiety on the part of the line and staff of the navy as to the rank attained or rapidity of promotion in the marine corps—any more than in the case of the army. The relations of the regular navy and the reserve and the mutual performance of duty are, it is true, much closer and more correlated than in the case of marines or army, but it should be perfectly possible for the two corps to maintain

their mutual respect and harmonious co-operation. The reserve is a volunteer, auxiliary service. It does not seek absorption of or by the regular service and does not desire to infringe on the *esprit de corps,* or lifelong prestige of what it looks up to as its "expert older brother." The writer feels there was much real, but mistaken apprehension on this score on the part of some officers in the service. To some extent this was engendered by conversations with army officers about the relations of the army and the national guard under the Dick Bill, as it was called, and at the time of the Mexican Border mobilization. If such difficulties or encroachments on the regular army actually occurred, their incidence is no indication that the naval reserve contemplated any similar activities. The writer cannot speak officially or collectively for the naval reserve, but only from his own experience. That experience has brought him, however, into personal contact with the leaders of the naval militia throughout the country, and he feels competent to judge of their motives and plans. The sole aim of these officers has been to build up an efficient reserve for the navy. Their desire for retention of command rank in the naval militia and now in the reserve has been inspired by a realization of the necessity for such. Men of the type needed to organize and build up and lead the naval reserve are, naturally and properly, ambitious, aggressive men; *successful* men who expect recognition and reward for their services. The only possible recognition or reward is in promotion to a higher grade. If such promotion be denied them beyond the relatively restricted grade of lieut. commander corresponding to major in the army's reserve of the national guard, what incentive have they and what inducement can they offer to the right sort of officer-material? These men may not be essential to the navy afloat in war, but they are capable of invaluable service ashore in administrative duty; and, prior to war, they are imperatively necessary in creating and organizing the reserve and rendering it attractive for those younger officers whose services will be needed afloat in war.

The writer has discussed above the opposition to command rank in the reserve. In favor there are the following reasons:

(a) It furnishes a means of reward, in peace or war, for deserving officers.

(b) It furnishes an incentive to enrollment and continuance in service of ambitious, efficient officers.

(c) It provides a logical flow of promotion in the reserve.

(d) It allows for a better and more systematic organization for the reserve by furnishing officers for the larger administrative units.

(e) It gives the units of the reserve, through their commanding officers, a greater local prestige and standing in comparison with national guard organizations at parades, reviews; in connection with civic and community activities, etc.

(f) Another reason, formerly of great importance in connection with the naval militia of the States was that the commanding officer should have adequate rank to command attention at the state capitol and to secure favorable legislation for the naval militia in active competition with the commanding officers of national guard organizations. Should the reserve be entirely dependent on federal support, this particular reason would no longer hold.

It may be stated, further that the granting of command rank to reserve officers entails no additional expense to the government in time of peace, as the highest retainer pay allowed under the law is based on the pay of a lieut. commander. In time of war it is believed that the services of those officers of the reserve attaining command rank would be fully worth the active duty pay; which, in most cases, would be considerably less than the compensation earned by men of their caliber in civil life.

In connection with the subject of organization, there should be considered the question of the different classes of the naval reserve. At present the relations of these classes to each other, and the method of transfer from one to the other are somewhat involved. The present arrangement is capable of much simplification and improvement. It is suggested that Class 6 be abolished entirely as unnecessary. There has been no occasion for its use since the passage of the act. There has been some discussion as to the desirability of merging Class 1 and Class 2. However, the former is of advantage in connection with the withdrawal from active service of men of the navy, and it would seem well to continue it. Class 2 should be confined exclusively to officers and men fully qualified and *confirmed* in their grade or rating. Class 2 should be considered as an immediate reserve available for any duty anywhere. All in Class 2 should come from Class 4, and no enrollments or provisional commissions should be made in this

class. Class 3, as now, should be the auxiliary reserve for merchant-type vessels, All officers or men seeking service with combatant vessels, should be transferred to Class 4 (G), whence if qualified and confirmed they may be further transferred to Class 2. Class 4 should be divided into two general groups: Class 4 (G) composed of those available for general service and seeking service afloat and further training with a view to confirmation and qualification in Class 3: Class 4 (T) composed of the technicist officers and men whose service, by limitations of age or other reasons, is confined exclusively to shore duty, and whose enrollment is frequently made for a special, designated job. To this Class 4 (T) would belong the Yeomen (F), etc.

Class 5 would be continued, as previously, for the aviation service.

IV. EQUIPMENT

The uniform equipment for officers and men of the reserve should be as provided by present regulations. It should be optional, however, for officers to have and wear, when same are designated, such additional articles of uniform equipment as are prescribed or authorized for officers of the navy.

It is the belief of the writer, however, that the officers and men of the reserve should bear some distinguishing mark or device to differentiate them from the navy. This emblem should be of such a character that to the layman, or to a person at a distance of a few yards, there would be no apparent distinction between the branches of the service. To the initiated, however, the difference would be as distinctive and as useful as the differentiation in corps device or rating badges of the regular service. It is submitted that the same excellent reasons for indicating differences of the corps of the navy by device and rating badge, hold for differentiating the navy and the naval reserve as separate branches of the naval service. It is felt that this desire for differentiation is concurred in by very many of the reserve officers. They have no desire to pretend, within the service, to the knowledge and *réclame* due to the professional officer of the regular navy who has made the service a life vocation. They are, also, proud of the fact that their service is voluntary and tendered by them to the government in its time of need as a patriotic offering, often made at a sacrifice of personal and financial welfare. So, too, the officers of the auxiliary reserve (Class 3) though often ill at ease and hesitant in

the unaccustomed surroundings of drill and life aboard a vessel of the regular service, are justly proud of their long training and the skill acquired thereby as competent navigators and seamen in the handling of merchant ships upon all seas. The fact that they enrolled and are skilled for a special branch of the service should be indicated in their uniform. Aboard ship, the ship's company recognize the surgeon's corps device and know wherein his skill lies. They do not expect him to handle the forward turret, any more than they expect the turret officer to operate upon them for appendicitis. If we dress all officers in the same uniform we have a right to expect of them the same standard of performance, which is not fair to the individual of special training or qualification. If, however, an officer has fully qualified in the department's opinion for the duties of his grade he then should wear the insignia indicating that fact.

In accordance with the foregoing, it is therefore recommended that the reserve uniforms be differentiated as follows:

OFFICERS

Class No. 1 and Class No. 2 (fully qualified and confirmed), same as navy.

Class No. 3. Foul anchor in lieu of star on sleeve and shoulder mark.

Class No. 4. Circle around star, as formerly worn by N. N. V.

ENLISTED MEN

Class No. 1 and No. 2. Same as navy.

Class No. 3 and No. 4. Anchor within diamond as worn by N. N. V. formerly.

The question of ordnance equipment, etc., will be discussed under the heading of Training.

V. TRAINING

The problem of training the naval reserve in time of peace involves several factors: the proper location of training points with reference to the distribution of the reserve personnel; the supply of officers and men for training purposes; the supply of the necessary material in way of ships or drill halls, navigation and ordnance equipment, etc.; the amount and kind of training to be given to each individual; the standardization of training so that the naval reserve may be developed systematically and as a homogeneous body through its ranks and ratings. In considering these factors much valuable information is gained from a study of the

work of the naval militia through the past twenty-five years. In a general way, the system of the naval militia as modified and improved by greater departmental control and co-operation in three years or so previous to the war would seem the best for the training of the reserve. The local instruction, discipline and drill, however, varied considerably in the different states. With complete federal control, the routine of drills, schedule of instruction, length of drill periods, number of same, requirements as to orderliness, neatness, discipline and all the other essentials of an efficient organization should be standardized throughout the country and officer, petty-officer, or man drilling at Boston or Duluth, would undergo within the limits of human variability, the same discipline and training as those at San Francisco or New Orleans.

Let us take up, in order, the factors of training mentioned above:

First, as to location of training points, the problem is solved by the distribution of the local headquarters of the battalions and divisions throughout the districts, at points where there is the greatest density of reserve population. Naturally it is very desirable that these points should be on deep water, but considerable preliminary training can begin at armories inland, and there are many places inland where there is some body of water nearby on which rowing and sailing can be practiced in standard navy boats.

Along the coast, on the Great Lakes, and on the navigable rivers flowing into the sea, it will be possible to provide naval vessels for local organizations, to serve as armories, for drill and for practice cruising. The navy has a number of vessels which are not required by the active service, but which are desirable to be retained in reserve. No better way of doing this could be found than by assigning them to the training of reserves at every available point. The vessels could be kept in quite as good condition as at navy yards, and the personnel would be kept in better condition, it is believed. With the completion of their complement by reserves for training, these vessels would make frequent cruises. They would act as local rendezvous for the reserves within a certain radius therefrom. With our many harbors, oceans, lake, and river, it should not be necessary for any reservist to travel far in order to report on board of one of these vessels for a period of training. He should be allowed to do so at any time in the year, at his own convenience, with the understanding

that his travel expense would be paid only for a period of service under conditions as follows or under some similar arrangement:

(a) No period of training on rendezvous vessel, where subsistence and travel expense are provided, to be for less than one week.

(b) If period is one week or more and less than fifteen days: no pay, but subsistence and travel-expense for a distance of not over fifty miles and return, to be provided.

(c) For a period of fifteen days or over: no pay, but subsistence and travel expense for a distance of not over one hundred miles.

(d) For periods in excess of three weeks, but in no case to exceed three months: no pay but subsistence, and travel expenses for any distance; but travel would be authorized only to specifically designated rendezvous vessel of recruit.

(e) Except when mobilizing under orders, reserves desiring training at other points than designated rendezvous, would obtain special authorization for such training but would travel at their own expense. This would allow reserves to make choice of locality in which they volunteered for training, such as California or the south in winter, yet would not cause unjustified transportation expense to the department.

Under the present law, the minimum period of service for retainer pay is fifteen days. For *active* service in qualification for retainer pay this minimum is correct; as past experience with naval militia has shown that so much time was taken in embarking, assigning and " shaking down " men, and in disembarking them that shorter periods did not leave enough actual available time for a course of instruction sufficient to cover even an outline of ship's work, and justify the expense of mobilization. The periods intended above are to be undergone without active duty pay and not as a part of the required active service period, but as a part of the system of instruction, and should be applied as credit on the annual requirement of thirty-six drill periods a year. Credit should be allowed at the rate of four periods for each week day from 8.00 a. m. to 4.30 p. m., on board; except Saturday from 8.00 a. m. to noon; for which two periods would be credited. No credits to be allowed for Sundays and holidays except when underway on cruise. In addition, of course, there should be a series of evening drill periods through the year, which local reserves should be authorized to attend. These periods should be of two hours'

duration, partly theoretical and partly practical instruction. Attendance at one of these should count as one drill period towards the thirty-six required. The calendar dates assigned these can be left to the district aide for personnel, but the scheme of instruction and subjects taken up should be arranged by the department, to insure uniformity throughout the reserve.

In regard to the assignment of vessels, it is recommended that reserve battleships be assigned to the larger ports, with reserve destroyers or Eagle boats, and subchasers as tenders and auxiliaries. At secondary points reserve cruisers should be assigned with auxiliaries and at points where single divisions are located Eagles or subchasers should be assigned.

To indicate any tentative assignment of vessels would call for a complete knowledge of the distribution of reserve personnel and a knowledge of the vessels available under "exigencies of the service" that is at present not available; but, to indicate roughly the suggestion of the writer, the following would be assignments for the Third and Eighth districts under this plan:

THIRD DISTRICT

TYPE OF VESSEL	LOCATION
1 Reserve battleship	North River, New York City
1 Reserve battleship	Off Bay Ridge, Brooklyn.
1 Eagle boat and 2 Subchasers	Attached to each of the above.
1 3d-class cruiser or gunboat and 1 subchaser	New Haven, Conn.
1 3d-class cruiser or gunboat and 1 subchaser	Newark, N. J.
1 Eagle boat	Newburgh, N. Y.
1 Eagle boat	Bridgeport, Conn.
1 Subchaser	Albany, N. Y.
1 Subchaser	Ossining, N. Y.
1 Subchaser	Yonkers, N. Y.
1 Subchaser	Flushing, N. Y.
1 Subchaser	New Rochelle, N. Y.
1 Subchaser	Port Jefferson, N. Y.
1 Subchaser	Sag Harbor, N. Y.

EIGHTH DISTRICT

1 Cruiser (*Chicago* or *Olympia* type)	New Orleans, La.
1 Eagle boat and 2 Subchasers	Attached.

1 3d-class cruiser or gunboat..Galveston, Texas.
1 Subchaser .....Attached.
1 3d-class cruiser or gunboat..Mobile, Ala.
1 Subchaser .....Attached.
1 Eagle boat .....Pensacola, Fla.
1 Subchaser .....Port Arthur, Texas.
1 Subchaser .....Vicksburg, Miss.
1 Subchaser .....Memphis, Tenn.

It is recognized that at many large centers of population it will be necessary to provide armories or drill halls, where vessels are not available, or in addition to vessels. In fact, such armories are desirable for the providing of assembly and recreation places for the organized reserve units, and, as previously stated, for the furthering of their *esprit de corps* and interest. Such armories will be a source of considerable expense by purchase, or rent; but if the reserve is truly to be what its name indicates, a *reserve* of selected, available, partly trained officers and men, and not a mere card-index of raw material, then the government should be prepared to go to any reasonable expense to further such a body and "in time of peace, prepare for war."

The foregoing notes are but a general outline of the questions to be considered in regard to the future of the reserve and many important points have perhaps not been touched upon. It is hoped that the officers of the navy and of the naval reserve will devote their thought and effort to further discussion of this subject to the end that this great reserve organization may be continued and perfected in every detail so that the "man behind the man behind the gun" as represented by the reservist may be ready and trained to take his place in line with his senior brother of the navy.

NOTE.—The above was prepared in June, 1919, since which date the Department has gone ahead with the systematic organization of the Naval Reserve, and in so doing has provided for many of the points covered by recommendations in this article. In particular, provision has been made for organization along the lines of the recommendations of Section III, paragraphs two, three, and four. The Department has also provided for distinctive uniform devices and thereby rendered superfluous the recommendations of my Section IV regarding uniforms. The Department also contemplates acceptance of one week's continuous service under drill and instruction as the equivalent of the thirty-six drills a year. This is more liberal than the recommendations of Section V, paragraph five above, and undoubtedly will allow of more reserves qualifying than under the plan above. C. L. P.

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DID THE *CYCLOPS* TURN TURTLE?

By LIEUT. COMMANDER MAHLON S. TISDALE, U. S. Navy

Although the loss of the U. S. S. *Cyclops* bids fair to be one of the mysteries of the war, many theories have been advanced during the usual "ward room arguments," the general consensus of opinion being that she capsized. This deduction is always made, it seems to me, because, although the finale of the conversation is to the effect that "surely something would have floated," no other solution seems at all tenable. In other words, a good many officers agree that she capsized, but few have any good reason to offer as proof of this belief.

Through a peculiar train of circumstances I happened to live through an incident which I believe lends a certain plausibility to the capsizing theory.

In December, 1914, I was ordered to the U. S. S. *Neptune* as a part of her commissioning complement. During the first few months after going into commission considerable trouble was experienced in keeping the ship on an even keel—even when alongside the dock. She was built with athwartship double bottoms fitted with baffles but in such a way as to permit water moving completely across the ship during a list or a roll. Running along the side of the ship immediately under the main deck were "topside tanks." These tanks extended outboard from the coaling hatches to the outer skin in an athwartship direction, had a sloping bottom which extended down some eight feet (estimated), and the series of tanks ran from the forward bridge to the break of the poop on each side of the ship. In the weather deck, on each side of the ship, was fitted a series of manhole plates each giving access to one topside tank. These were not manhole plates in the usual meaning of the term, but resembled the circular brass bunker plates as used on battleships. The bottom of the *Neptune* was flat and the double bottoms ran all the way across the flat. The topside tanks, as can be seen from the above description, were high

above the keel and extended only some one-third of the distance from the sheer strake to the center line. A considerable purchase could thus be obtained by filling topside tanks; and a slight list caused by an excess of water in the tanks of one side would soon increase considerably, due to the free water in the double bottoms, which would, of course, immediately rush across the ship. This is assuming that the bottoms were not full.

As the *Cyclops* was similar in construction to the *Neptune* it is fair to assume that conditions of trim obtaining on one obtained also on the other. I have seen the *Neptune* " flop " ten degrees for no apparent reason. If in so flopping something suddenly occurred to accentuate the list, such as the flooding of the topside tanks on the down side, is it not perfectly plausible to assume that this accentuation might have increased to such a degree as to cause the ship to turn turtle?

The *Neptune* was of some 19,600 tons displacement when loaded to capacity with 10,500 tons of coal. The ratio between cargo and total displacement gives an idea of the great freeboard existing when the ship was entirely empty. This freeboard was so considerable that although the motion of the ship in a seaway was more than noticeable it was unusual to take water over the main deck abaft the break of the forecastle when the ship was light.

This was exemplified by my experience on the *Cyclops*.

In the fall of 1916, while attached to the U. S. S. *Pennsylvania*, I was detailed to make a ten-day trip on the *Cyclops* as communication officer for the war game, held that year. We got underway at Newport and followed our flagship—the *Vestal*—together with two or three other colliers representing the " black " fleet or the " red " fleet—I am a little hazy on the particular shade of the rainbow involved in this battle—toward the rendezvous from which we were to begin our attack on the United States. Each of our " fleet " was towing a destroyer in order to save its fuel until the opening day of the fight.

On the afternoon of the second day it began to blow. One by one the towlines parted. Captain Worley (Master U. S. N. A. S.) of the *Cyclops*, gave our tow—the *Conyngham*—all the line we had available and by so doing and by the *Conyngham* going ahead slow to ease the strain, we managed to hold our tow until all the other colliers had parted lines; but eventually ours snapped and

as the sea was then too rough to attempt picking up another line the destroyers were forced to come ahead on their own. The *Vestal* alone succeeded in holding her tow, and I believe that she had a towing engine.

The *Cyclops* had only 1000 tons of coal distributed among her various cargo holds and was riding high out of the water. The wind had worked itself into a gale and had beaten up a very rough sea. The destroyers were rolling so that it did not appear physically possible for them all to come through safely. During the afternoon of the third day conditions had grown steadily worse. The captain asked me to remain on the bridge while he went aft for supper. Upon his return—this was the evening of the third day out—I fought my way aft, wrapped myself around the particular stanchion that I had come to regard as mine, hurriedly ate a sandwich or two, filled my pockets with oranges for the long night ahead of me and started back to the bridge.

On each side of these colliers, inboard against the cargo hatches run the steam lines for the winches and for the auxiliary machinery forward. These pipes are encased with light sheet metal and the cover is corrugated as are fire room floorplates. This forms a runway leading from the break of the forecastle aft to the break of the poop. The men call this the "bicycle track" for no better reason I suppose than that one could not ride a bicycle on it.

In going back to the bridge from the wardroom I started along the bicycle track as usual, but as I came abreast the manhole plate for the starboard after topside tank I was thrown off the track onto the main deck. We had lifelines rigged to assist in walking forward and aft, but the lurch of the ship broke my hold. I landed near the topside tank manhole and my attention was at once caught by the fact that the plate was *not secured*. I slid the plate into position as best I could with one hand—I was carrying a sigcode book—and set up the central screw finger-tight, thinking all the time I worked how fortunate it was that I had served on the *Neptune* and had there learned the value of keeping tank tops tight. On starting forward again I was astonished to find that the next plate was also cast off. Upon looking further, all plates were seen to be adrift. Deciding that securing all of them was too much of a job to do with one hand, I fought my way to the bridge and reported to the captain that someone had opened all of the

topside tanks. He laughed at my earnestness and said that they were *always left off* in accordance with instructions from the navy yard. . . . . (I won't mention the yard, as I never saw the circular during my time in the colliers) as the air was "better for the bitumastic." The skipper was worrying not at all about the tanks. We were cavorting around the old ocean like a frisky colt, but, true enough, were taking no green seas over the main deck. As I have said, we were light and high out of the water. The captain was worrying about his cargo. With such a small amount of coal in the cargo holds and with no braces rigged to hold it in place, it was not improbable that the cargo might shift.

Standing at the clinometer that night I saw it register 48 degrees to port and 56 to starboard. (Now you destroyer men consider the size of the ship before you compare notes disparagingly.) So much for proof that these ships can roll when tempted. During this rolling she was dry so far as green seas were concerned, but this was due to her freeboard. I have seen the *Neptune* at full load ship seas on her well deck which carried away the side plating on the bicycle track to such an extent that we had to heave to for repairs.

Now let us take the case of the *Cyclops* on her ill-fated voyage of last year when she was lost. She was carrying manganese ore (according to newspaper reports we received abroad at the time). Due to the great weight per cubic foot of this ore as compared to coal it is probable that her cargo holds were loaded by weight and not by volume and were therefore far from full. Perhaps the cargo was braced to prevent shifting—but this would have required very strong braces, far beyond the capacity of the ship's carpenter. Unless these braces were installed at the loading port they were probably not installed at all. Now the matter sizes up as follows:

The ship was heavily loaded—hence deep in the water with a correspondingly small freeboard—but her holds were not full by *volume.*

It was customary to leave the manhole plates off the topside tanks according to the statement of the captain (she had the same captain when I made my cruise on her as she had when she was lost) in order to "preserve the bitumastic."

Due to her load her sea connections from the topside tanks were probably submerged. These were in the skin of the ship and led from the bottom of the tank.

In any sort of a storm it was always customary in the colliers, due to their liveliness and to their great amount of top hamper, to secure *everything* for sea. I have seen even the huge iron sister-blocks which are shackled to the fore and aft girder, lashed together to prevent pounding.

Is it not plausible to assume that the cargo may have shifted, perhaps only a little, but enough to increase the average list sufficiently to cause the free water in the double bottoms to rush toward the down side thus further increasing the list. Suppose the heavily laden *Cyclops* now shipped a sea. Would not this sea run into the open manholes of the topside tanks and immediately give the ship a tendency to capsize?

This could all occur in a few seconds and the ship would be bottom up before any one could abandon ship. Some few men from the bridge and poop might have been thrown clear of the ship. But with everything secured for sea there would be little wreckage. Remember that there would be nothing adrift except such gear as would be free to float off during the few seconds during the turn. There would be no debris such as always follows a sinking due to other marine casualty, as in the case of striking a a mine or torpedo. There would have been no time for an "S. O. S." There would have been no time for anything. The few men in the water could not have lived long of their own accord. Such small gear as did float off would have been lost in the vastness of the ocean long before the rescue vessels started their search.

This seems to me a plausible solution of the loss of the *Cyclops*. Of course it is only a theory based upon several assumptions, some of which may be faulty. As several officers have said, "Yours seems to be the only plausible theory," it occurred to me that the service as a whole might be interested.

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A DESCRIPTION OF THE BATTLE OF JUTLAND
(CONCLUDED)

By LIEUT. COMMANDER HOLLOWAY H. FROST, U. S. Navy

XVI. THE ENGAGEMENT BETWEEN THE BATTLE FLEETS. MOVE 11B. 6.30 TO 6.55 P. M. POSITION 11B

At 6.30 the *Colossus* and the fifth division opened fire. At 6.31 the *Iron Duke* opened fire at a range of 12,000 yards; the ships of the third and fourth divisions opened fire about this time. Soon after, say 6.35, the first battle squadron opened also, this giving Jellicoe a total of 27 battleships in action. At 6.33 the speed was increased to 17 knots.

At 6.38 the last ship of the sixth division had changed course to 110° true and the deployment had been completed. At 6.40 the *King George V*, leader of the battle fleet, changed course to 121° true, without orders, to close the enemy. At 6.50 the *King George V* changed course to south (166° true) and at 6.51, upon orders from the commander-in-chief all division leaders changed simultaneously to the same course. By 6.55 all vessels of the battle fleet were on course 166° true.

As early as 6.40 the *St. Vincent* had sighted a torpedo which stopped short of the battle line; at 6.45 the *Marlborough* changed course to avoid one, but at 6.54 she was hit by one under the forward bridge. Although the ship took a list of 7° to starboard, she was still able to keep in formation.

At 6.33 the *Invincible* was struck by a heavy shell in the "Q" turret. It pierced the armor and burst inside; a magazine exploded and the ship broke in half and sank. Only two officers and four men were saved. The *Inflexible* then took the lead of the battle cruiser line. At 6.38 three torpedoes fired by the German destroyers passed astern of the *Tiger* and at 6.40 one passed under the *Princess Royal*. At 6.50 the rear battle cruiser had cleared the leading ship of the battle fleet, speed was reduced to 18 knots and course was changed to 210° true. Admiral Beatty ordered *Inflexible* and *Indomitable* to take station in the rear of the battle cruiser line.

The second cruiser squadron, with the *Duke of Edinburgh* and *Chester* added, and the fourth light cruiser squadron took station on the unengaged beam of *King George V*.

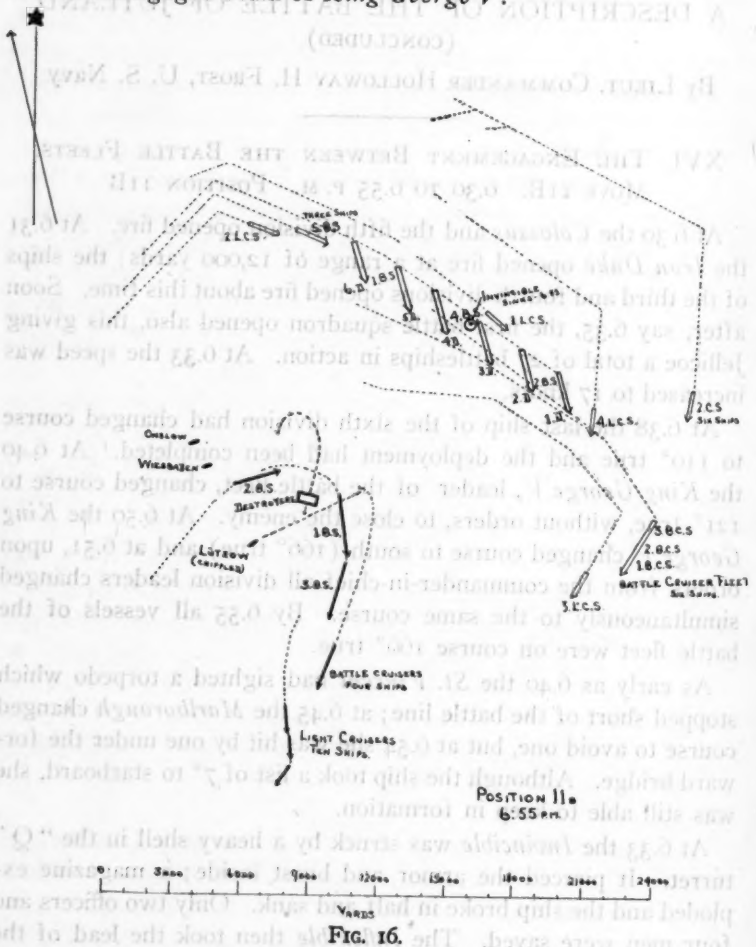


FIG. 16.

At about 6.30 the German battle cruisers turned away from the enemy about 90°, and, changing course in succession, headed about south (true). The *Lutzow*, having been hit by more than 15 heavy shells and one torpedo, left the line at about 6.32. Admiral Hipper boarded a destroyer to shift his flag to another ship. The Captain of the *Derfflinger* took command of the battle cruisers. Hipper later hoisted his flag on the *Moltke*.

The German battle fleet followed the battle cruisers on their southerly course, the ships turning in succession. The German destroyer flotilla which had advanced inside the lines fired a number of torpedoes and retired. One of the torpedoes hit the *Marlborough.* It is probable that a number of German battleships fired torpedoes at this time. Two submarines were reported by the British battle fleet, and these also probably fired torpedoes.

Despite the poor visibility conditions, the smoke of funnels and guns, and the smoke screens laid by the Germans to cover their retirement, the fire of the British battle fleet was effective and many hits were made on the German battle cruisers and the leading German battleships. The leader of the German battle fleet, *Konig,* received 15 hits from heavy shells during the action and probably many were made at this time. Practically no damage was inflicted on the British battle fleet. To some extent this failure of the Germans was due to the visibility, which was much worse for them than for the British.

XVII. Continuation of the First Fleet Action. Move 12A. 6.55 to 7.15 p. m. Position 12A.

At about 7 p. m. Admiral Jellicoe signalled for the second battle squadron to form column ahead of the *Iron Duke* and for the first battle squadron to form column astern. The object of this signal was to form the battle fleet into single column again.

At 7 p. m. the *Marlborough* turned away to avoid three torpedoes, two of which passed ahead and one astern. At 7.03 she reopened fire and at 7.12 fired 14 salvos at a vessel of the *Kaiser* class.

At 7.05 the course of division leaders was changed to 199° true to close the enemy, but at 7.07 it was changed back to 166° true.

At 7.08 a torpedo went astern of the *Agincourt* and at 7.09 another went ahead of the *Revenge.* Two ships ahead of the *Iron Duke* reported a submarine on the port bow.

At 7.10 one or more flotillas of German destroyers supported by a light cruiser were seen from the *Iron Duke* bearing 216° true. When at a range of about 10,000 yards a heavy fire was opened on them by the battle fleet. They pushed on gallantly and at 7.15 were probably about 7500 yards distant.

At 7.10 the destroyer flotillas with the battle fleet had reached their assigned positions. Two flotillas were about three miles

ahead of the battle fleet and a little on the engaged bow, while one flotilla was astern.

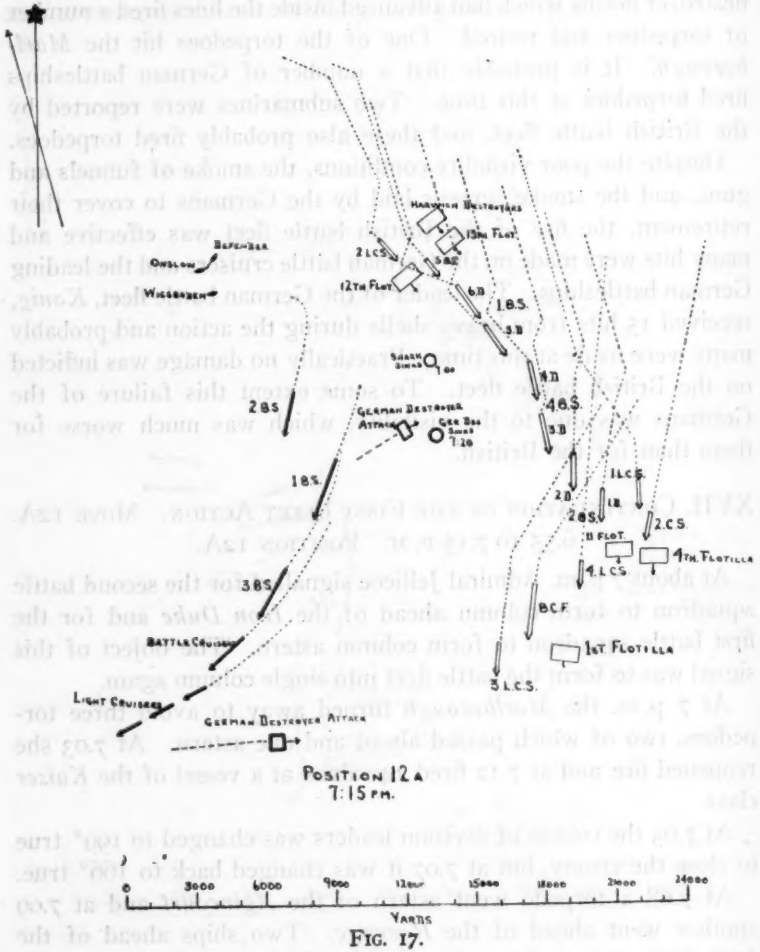


FIG. 17.

At 7.15 the battle line of the Grand Fleet ran as follows:

1. Third light cruiser squadron heading 190° true.
2. Battle cruiser fleet on the port quarter of the third light cruiser squadron, steering about 190° true. The squadrons were in the following order:
   (a) *Lion*, fleet flagship.
   (b) First battle cruiser squadron....*Princess Royal* and *Tiger*.
   (c) Second battle cruiser squadron..*New Zealand*.
   (d) Third battle cruiser squadron...*Inflexible* and *Indomitable*.

3. First flotilla slightly forward of the port beam of the *Lion.*
4. Fourth light cruiser squadron on the port quarter of the battle cruiser fleet, steering about 180° true.
5. Fourth and eleventh flotillas slightly abaft the beam of the fourth light cruiser squadron.
6. First division on the port quarter of the fourth light cruiser squadron, steering 180° true.
7. Second division astern of the fourth light cruiser squadron, steering 175° true.
8. Second cruiser squadron and first light cruiser squadron on the port beam of the first division trying to gain station ahead of battle fleet.
9. Third and fourth divisions on the starboard quarter of the second division, steering about 166° true.
10. Fifth and sixth divisions on the starboard quarter of the fourth division, steering about 145° true.
11. Fifth battle squadron astern of the sixth division, steering 145° true.
12. Twelfth flotilla and second light cruiser squadron on the starboard quarter of the fifth battle spuadron.
13. Thirteenth flotilla and the Harwich destroyers of the ninth and tenth flotillas on the port quarter of the fifth battle squadron.

The German forces were receiving numerous hits as a result of the effective fire of the battle fleet. By this time it must have been apparent to Admiral Scheer that he could not expect to defeat the Grand Fleet, which had the advantage of the visibility conditions in addition to having a superiority in fighting strength of 8 to 5. Scheer therefore made every effort to break off the action with the British battle fleet. Only two or three battle cruisers remained in formation and these gradually turned away to the right until by 7.15 they were headed to the southwestward. The *Lutzow* and one or two other battle cruisers had fallen out of formation and were receiving a heavy fire at the rear of the German battle line. The battle fleet in ragged formation followed the battle cruisers, which still remained in formation, and returned the fire of the British battle fleet at ranges of from 9000 to 12,000 yards. Destroyers frequently laid smoke screens and at 7.10 one or more flotillas advanced to attack the British battleships.

Admiral Jellicoe details the fire of the battle fleet as follows:

1. *Iron Duke* at 7.15 engaged a battleship at 15,000 yards range.
2. *Iron Duke* at 7.20 trained her guns on a battle cruiser of the *Lutzow* type, abaft the beam, but before fire could be opened the target ran behind a smoke screen made by destroyers. This ship was probably the crippled *Lutzow* which had fallen out of formation at that point over half an hour before.

3. *King George V* at 7.17 opened fire on a ship, which was thought to be the leading ship of the battle fleet, at a range of 13,000 yards.
4. *Orion* at 7.01 was firing at a battleship of the *Konig* class which was observed to be on fire.
5. *St. Vincent* was firing effectively at a battleship until 7.26 at the range of 9500 yards.
6. *Agincourt* at 7.06 opened fire at 11,000 yards on one of four battleships and at least four of her salvos straddled the target.
7. *Revenge* made distinct hits on two ships which were taken to be battle cruisers.
8. *Colossus* between 7.12 and 7.20 was firing at 9000 yards on the *Lutzow* and made several certain hits, two being on the water-line.
9. *Marlborough* at 7.12 fired 14 salvos at a ship of the *Konig* class, making so many hits that she was forced to leave the line.
10. *Royal Oak* at 7.15 opened fire at 14,000 yards at the leader of three battle cruisers. The enemy vessel turned away after being repeatedly hit and the two others were lost in the mist before fire could be shifted to them.

The other vessels of the battle fleet were probably firing with equal effect.

XVIII. RETIREMENT OF THE GERMAN FLEET. MOVE 12B. 7.15 TO 7.30 P. M. POSITION 12B

The flotilla of German destroyers, which at 7.15 was advancing toward the battle fleet, continued ahead. By 7.20 they had reached a range of 6500 yards. After firing a large number of torpedoes at the first battle squadron they gradually turned to the rear, one boat sinking.

By about 7.20 the British battle fleet had been formed in one long column on course 166° true. By 7.23 Admiral Jellicoe judged that it was time to turn away from the German destroyer flotilla if the torpedoes fired by it were to be avoided. He accordingly changed course 22° to the left, steadying on 144° true. This time the change of course was made by "sub-divisions." The first and third ship of each division changed course simultaneously, the second and fourth ships following them. This made 12 columns of two ships each. The fifth battle squadron of three ships proceeded in one column. At about 7.28 a further change of 22° to the left was made, bringing the course to 121° true.

At 7.25 the *Iron Duke* sighted another destroyer flotilla advancing. It bore about 30° forward of the starboard beam, or

about 204° true, distant about 9000 yards and was headed toward the *King George V*. Admiral Jellicoe ordered the fourth light cruiser squadron and the 4th and 11th flotillas to counter this

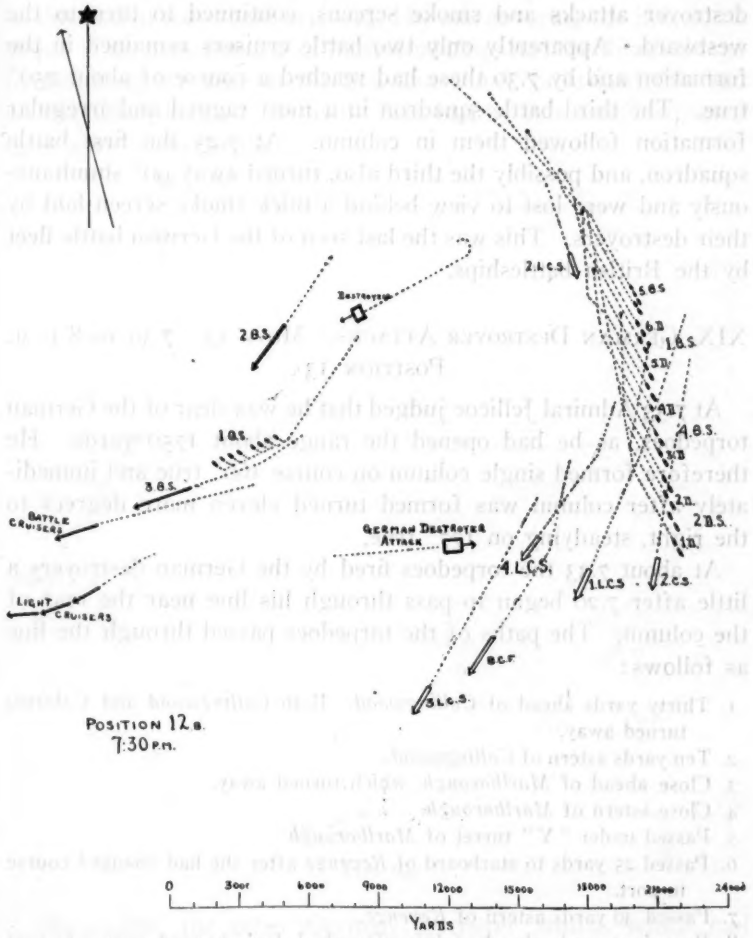


FIG. 18.

attack and they moved toward the German destroyers at high speed.

At 7.17 Beatty, having sighted two battle cruisers and two battleships of the *Konig* class at the head of the German line, opened fire again and increased speed to 22 knots. At 7.20, the range of the

enemy being about 15,000 yards, Beatty changed course to about 213° true to close them. His fire appeared to be very effective.

The German battle cruisers and battle fleet, under cover of their destroyer attacks and smoke screens, continued to turn to the westward. Apparently only two battle cruisers remained in the formation and by 7.30 these had reached a course of about 250° true. The third battle squadron in a most ragged and irregular formation followed them in column. At 7.25 the first battle squadron, and possibly the third also, turned away 90° simultaneously and were lost to view behind a thick smoke screen laid by their destroyers. This was the last seen of the German battle fleet by the British battleships.

XIX. GERMAN DESTROYER ATTACKS. MOVE 13. 7.30 TO 8 P. M. POSITION 13

At 7.33 Admiral Jellicoe judged that he was clear of the German torpedoes, as he had opened the range about 1750 yards. He therefore formed single column on course 166° true and immediately after column was formed turned eleven more degrees to the right, steadying on 177° true.

At about 7.33 the torpedoes fired by the German destroyers a little after 7.20 began to pass through his line near the rear of the column. The paths of the torpedoes passed through the line as follows:

1. Thirty yards ahead of *Collingwood*. Both *Collingwood* and *Colossus* turned away.
2. Ten yards astern of *Collingwood*.
3. Close ahead of *Marlborough*, which turned away.
4. Close astern of *Marlborough*.
5. Passed under "Y" turret of *Marlborough*.
6. Passed 25 yards to starboard of *Revenge* after she had changed course to port.
7. Passed 30 yards astern of *Revenge*.
8. Passed 30 yards ahead of *Hercules* which had changed course to port five points.
9. Close to stern of *Hercules*.
10. Seventy-five yards ahead of *Agincourt*.
11. Close astern of *Agincourt*.

12-15. Four torpedoes passed through the line close to *Barham*.

At least 15 torpedoes had therefore passed through the battle fleet. Jellicoe's turn away had not, as he hoped, brought the

battle fleet out of torpedo range; it had, however, increased the range so much that when the torpedoes reached the line they were practically at the end of their run and therefore running so slowly that they could be avoided by maneuvering the individual ships. This maneuvering of individual ships had the disadvantage of throwing the rear of the line into some confusion; this had no bad effect because the battle fleet had by this time completed their part in the battle.

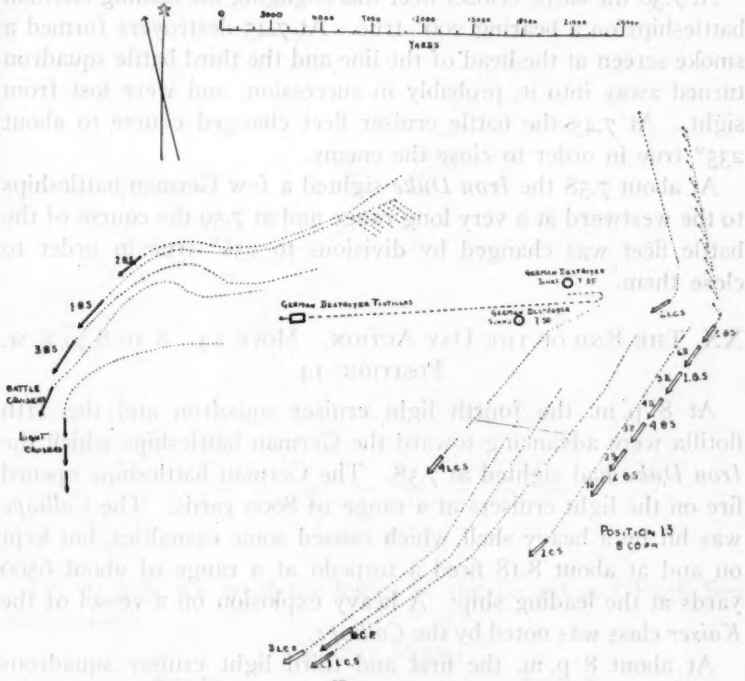


FIG. 19.

Meanwhile, the other German destroyer flotilla, which had been sighted by the *Iron Duke* at 7.25, had continued its advance. The fourth, first and fifth battle squadrons opened a very heavy fire on them. The fourth light cruiser squadron advanced against them; the German destroyers fired four torpedoes at the *Calliope,* leader of the light cruisers, from a position 75° on the starboard bow, distant about 7000 yards. At 7.25 one torpedo passed five yards ahead of the *Calliope,* one 10 yards astern and two others

fairly close. After the torpedoes had passed, the light cruisers headed directly towards them and two torpedoes passed on either side of the *Caroline*. At 7.50 the second light cruiser squadron, which was stationed at the end of the line, and a division of the 12th flotilla also attacked the German destroyers which now retired. One boat was sunk at about 7.35 and another, flying a commodore's pennant, at 7.50. Probably a number of other boats were badly damaged.

At 7.30 the battle cruiser fleet was engaging the leading German battleships on a bearing 290° true. At 7.45 destroyers formed a smoke screen at the head of the line and the third battle squadron turned away into it, probably in succession, and were lost from sight. At 7.45 the battle cruiser fleet changed course to about 235° true in order to close the enemy.

At about 7.58 the *Iron Duke* sighted a few German battleships to the westward at a very long range and at 7.59 the course of the battle fleet was changed by divisions to 256° true in order to close them.

XX. THE END OF THE DAY ACTION. MOVE 14. 8 TO 8.30 P. M. POSITION 14

At 8 p. m. the fourth light cruiser squadron and the 11th flotilla were advancing toward the German battleships which the *Iron Duke* had sighted at 7.58. The German battleships opened fire on the light cruisers at a range of 8000 yards. The *Calliope* was hit by a heavy shell which caused some casualties, but kept on and at about 8.18 fired a torpedo at a range of about 6500 yards at the leading ship. A heavy explosion on a vessel of the *Kaiser* class was noted by the *Calliope*.

At about 8 p. m. the first and third light cruiser squadrons commenced to search to the westward in accordance with orders from Admiral Beatty. They ran into the enemy and at 8.20 Beatty changed course toward them in support. At 8.22 two battle cruisers and two battleships were sighted and the battle cruiser fleet opened fire at 10,000 yards. The leading enemy ship, being repeatedly hit by the *Lion*, turned away 90°. The *Princess Royal* set on fire a battleship. The *New Zealand* and *Indomitable* set fire to the third ship in column and she hauled out of the line. The mist now shut out the enemy from view at about 8.25 and the *Lion* changed course again to about 211° true. The last ship

to see the enemy was the *Falmouth,* which reported that they had disappeared at 8.38, steering to the westward.

At 8.30 Jellicoe formed the battle fleet in single column on course 211° true.

The day action off Jutland Bank had ended.

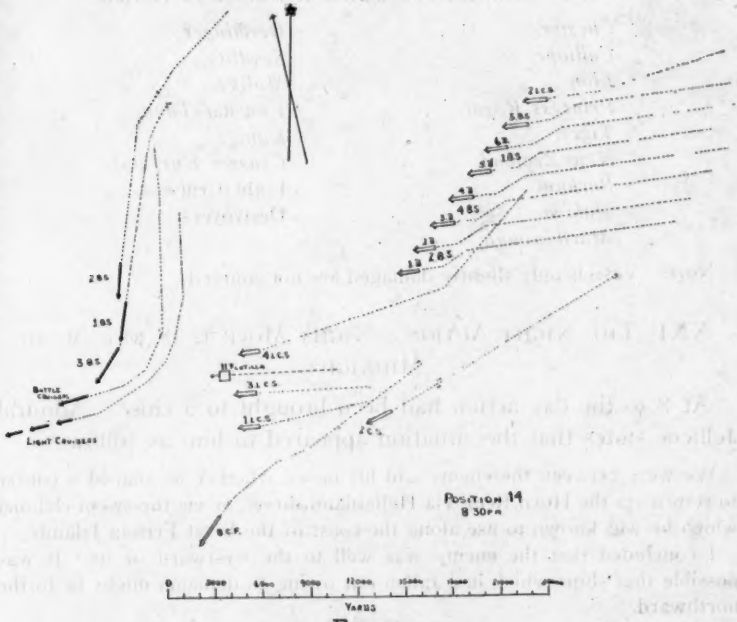


FIG. 20.

Let us now see what the losses of the Grand and High Sea fleets were:

VESSELS SUNK

BRITISH	GERMAN
Queen Mary.	Five destroyers.
Indefatigable.	
Invincible.	
Defense.	
Nestor.	
Nomad.	
Shark.	

VESSELS WHICH SANK FROM DAMAGE INFLICTED IN DAY ACTION

Warrior.	*Lutzow.*
	Wiesbaden.

VESSELS PUT OUT OF ACTION BY DAMAGE INFLICTED IN DAY ACTION

Warspite.
Onslow.
Defender.
Acasta.
Destroyers.

VESSELS DAMAGED BUT WHICH REMAINED IN ACTION

Chester.
Calliope.
Lion.
Princess Royal.
Tiger.
New Zealand.
Barham.
Malaya.
Marlborough.
Derfflinger.
Seydlitz.
Moltke.
Von der Tann.
Konig.
Grosser Kurfurst.
Light Cruisers.
Destroyers.

NOTE.—Vessels only slightly damaged are not counted.

XXI. THE NIGHT ACTION. NIGHT MOVE I. 8.30 P. M. TO MIDNIGHT

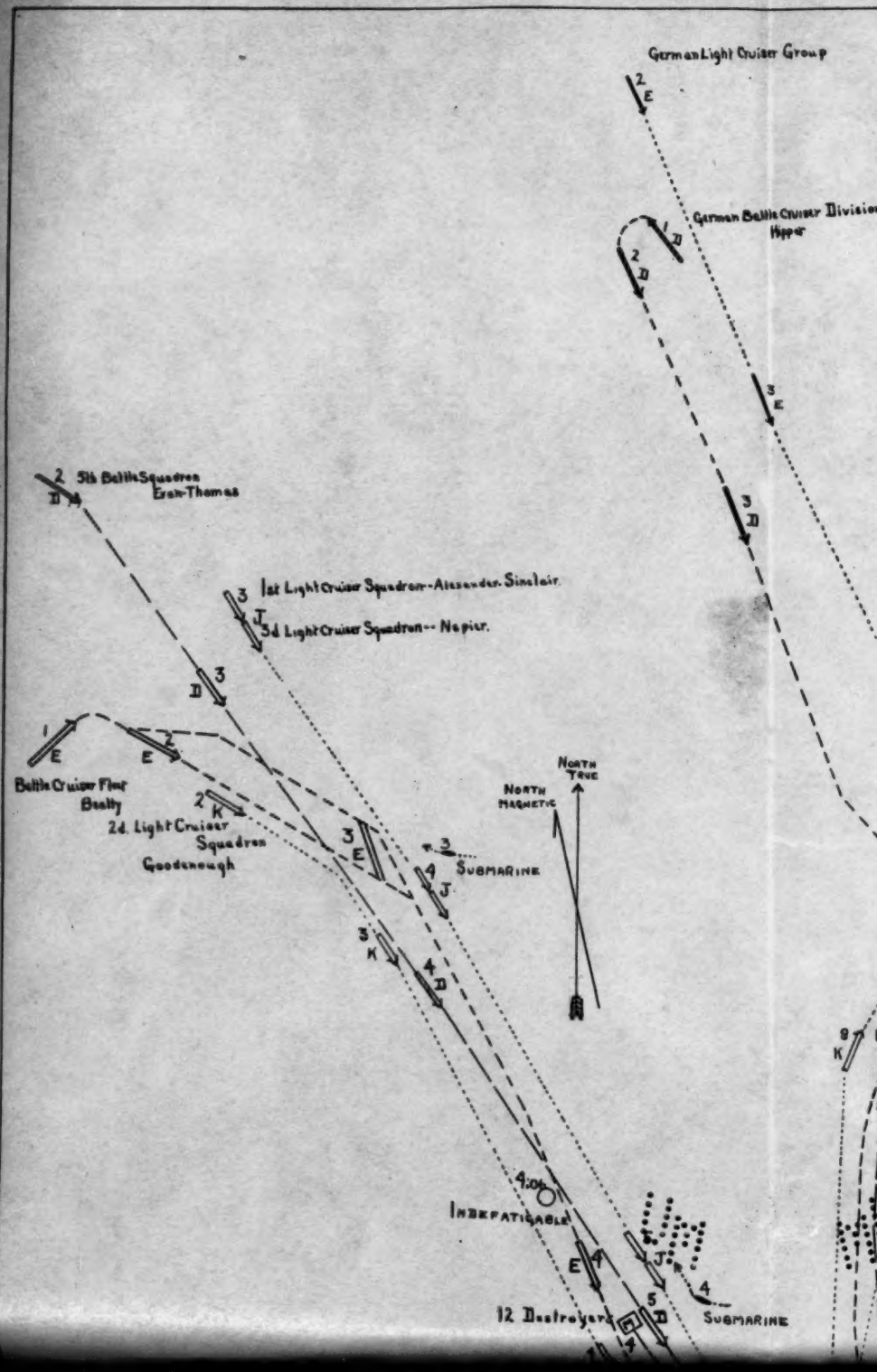
At 8.30 the day action had been brought to a close. Admiral Jellicoe states that the situation appeared to him as follows:

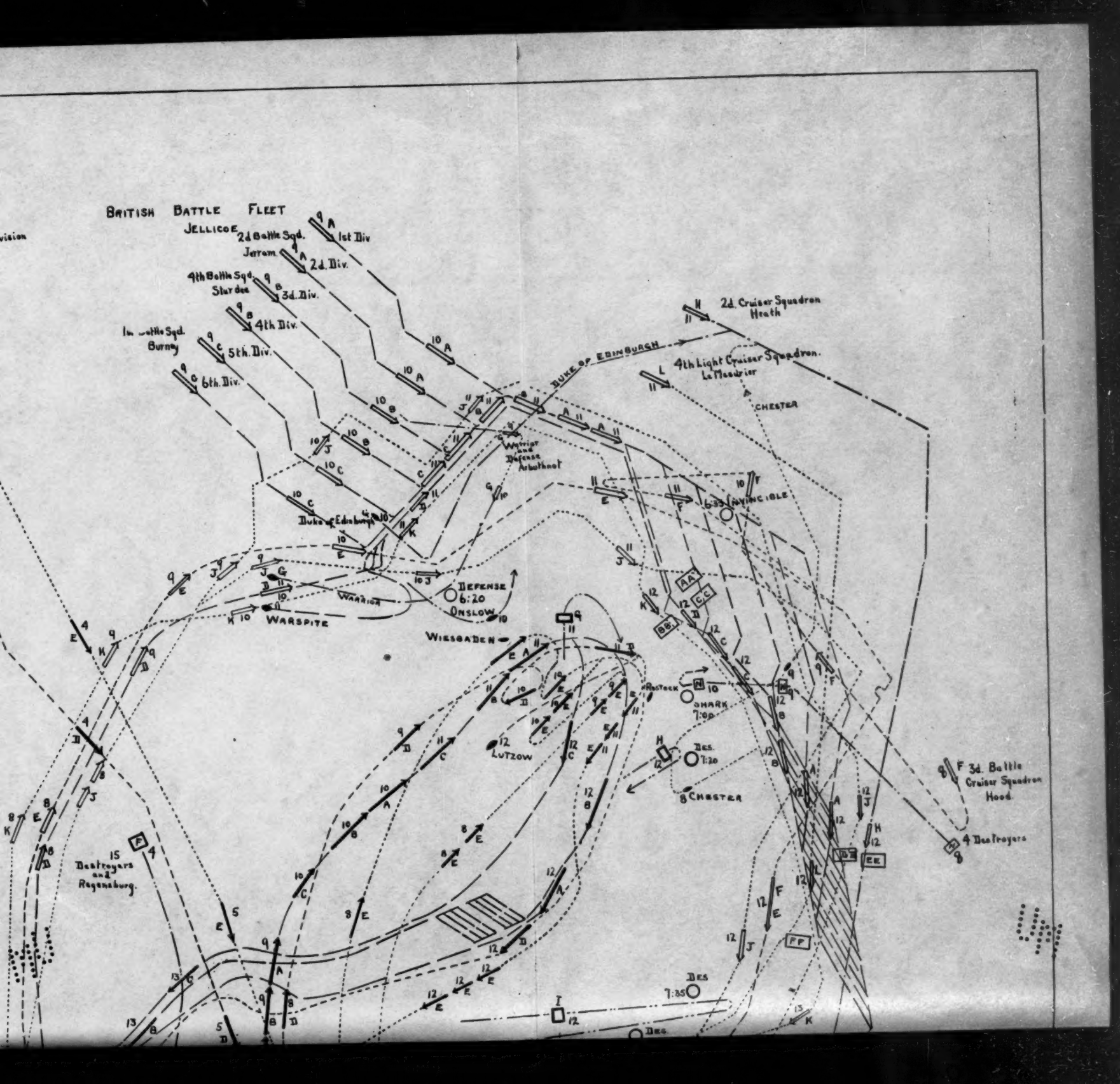
We were between the enemy and his bases, whether he shaped a course to return via the Horn Reef, via Heligoland direct, or via the swept channel which he was known to use along the coast of the West Frisian Islands.

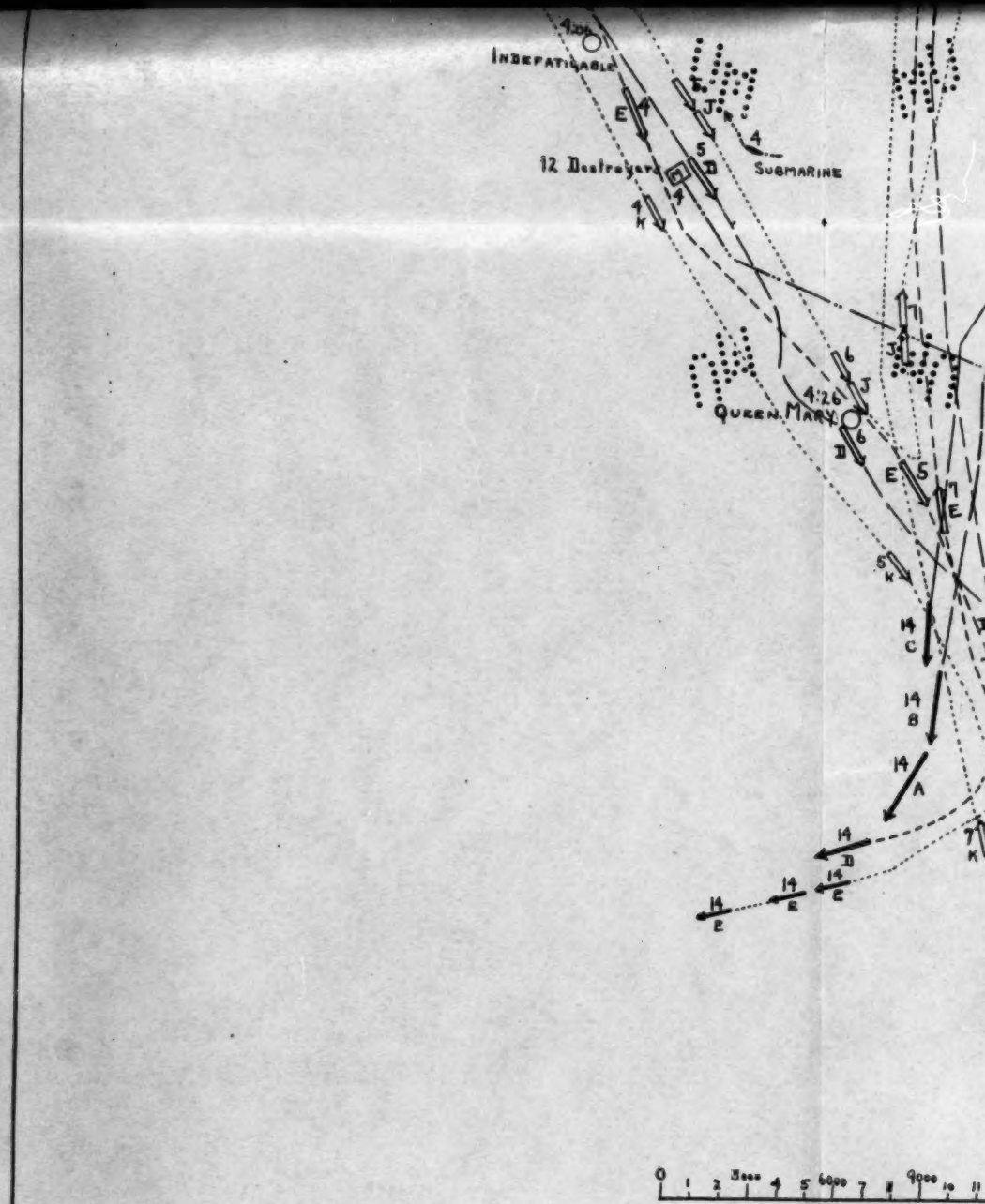
I concluded that the enemy was well to the westward of us. It was possible that ships which had fallen out owing to damage, might be to the northward.

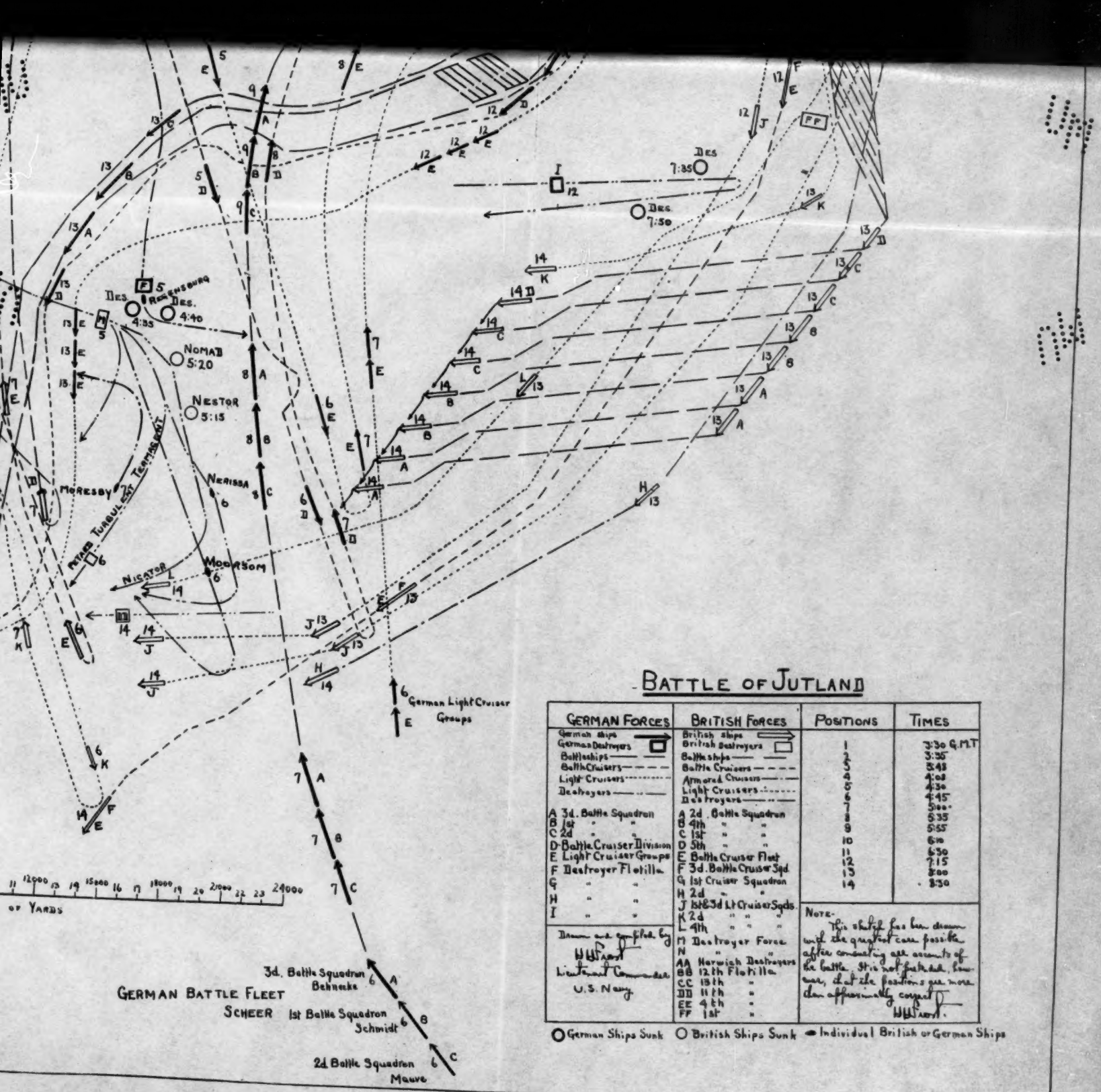
The sketch showing the positions at 8.30 places the center of the German battle fleet about 18,000 yards, about 260° true, from the *King George V*, the leader of the battle fleet and about 21,000 yards, 255° true, from the *Iron Duke*. The center of the German battle fleet was about 13,000 yards, 340° true, from the battle cruiser fleet. It is probable that several German vessels were still to the northward of the British battle fleet, having had their speed reduced due to damage.

From 8.30 to 9 p. m. both Beatty and Jellicoe continued on course about 211° true. The second cruiser squadron was midway between the battle cruiser fleet and the battle fleet. As the light cruisers lost touch with the German ships at about 8.38, it seems probable that the first and third light cruiser squadrons took station near the battle cruiser fleet and that the fourth light cruiser


German Light Cruiser Group
German Battle Cruiser Division
Hipper
5th Battle Squadron
Evan-Thomas
1st Light Cruiser Squadron--Alexander-Sinclair
3d Light Cruiser Squadron--Napier
Battle Cruiser Fleet
Beatty
2d Light Cruiser
Squadron
Goodenough
NORTH
TRUE
NORTH
MAGNETIC
SUBMARINE
INDEFATIGABLE
12 Destroyers
SUBMARINE


BRITISH BATTLE FLEET
JELLICOE
2d Battle Sqd.
1st Div
Jerram
2d. Div.
4th Battle Sqd.
Stardee
3d. Div.
4th Div.
1st Battle Sqd.
Burney
5th. Div.
6th. Div.
2d. Cruiser Squadron
Heath
BUKE OF EDINBURGH
4th Light Cruiser Squadron.
Le Mesurier
CHESTER
Warrior and Defense Arbuthnot
INVINCIBLE
6:33
Duke of Edinburgh
DEFENSE
6:20
ONSLOW
WARRIOR
WARSPITE
WIESBADEN
ROSTOCK
SHARK
7:0p
LUTZOW
DES.
1:20
CHESTER
F 3d. Battle Cruiser Squadron
Hood.
4 Destroyers
15 Destroyers and Regensburg.
DES.
7:35
DES.


4:20
INDEFATIGABLE
12 Destroyers
SUBMARINE
4:26
QUEEN MARY
0
1
2
3000
4
5
6000
7
8
9000
10
11
SCALE



Battle of Jutland

German Forces	British Forces	Positions	Times
German ships / German Destroyers	British ships / British Destroyers	1	3:30 G.M.T
Battleships	Battleships	2	3:35
Battle Cruisers	Battle Cruisers	3	3:48
Light Cruisers	Armored Cruisers	4	4:08
Destroyers	Light Cruisers	5	4:30
A 3d. Battle Squadron	Destroyers	6	4:45
B 1st " "	A 2d. Battle Squadron	7	5:00
C 2d " "	B 4th " "	8	5:35
D Battle Cruiser Division	C 1st " "	9	5:55
E Light Cruiser Groups	D 5th " "	10	6:10
F Destroyer Flotilla	E Battle Cruiser Fleet	11	6:30
G " "	F 3d. Battle Cruiser Sqd.	12	7:15
H " "	G 1st Cruiser Squadron	13	8:00
I " "	H 2d " "	14	8:30
	J 1st & 3d Lt Cruiser Sqds.		
	K 2d " " "		
	L 4th " " "		
	M Destroyer Force		
	N " "		
	AA Harwich Destroyers		
	BB 12th Flotilla		
	CC 13th "		
	DD 11th "		
	EE 4th "		
	FF 1st "		

Drawn and compiled by
H H Rousmaniere
Lieutenant Commander
U.S. Navy

Note-
This sketch has been drawn with the greatest care possible after consulting all accounts of the battle. It is not finished, however, but the positions are more than approximately correct
H H Rousmaniere.

○ German Ships Sunk ○ British Ships Sunk ⊸ Individual British or German Ships

squadron took position slightly ahead of the battle fleet. The second light cruiser squadron followed on the starboard quarter of the fifth battle squadron.

As the *Falmouth* at 8.38 reported the High Sea Fleet as steering

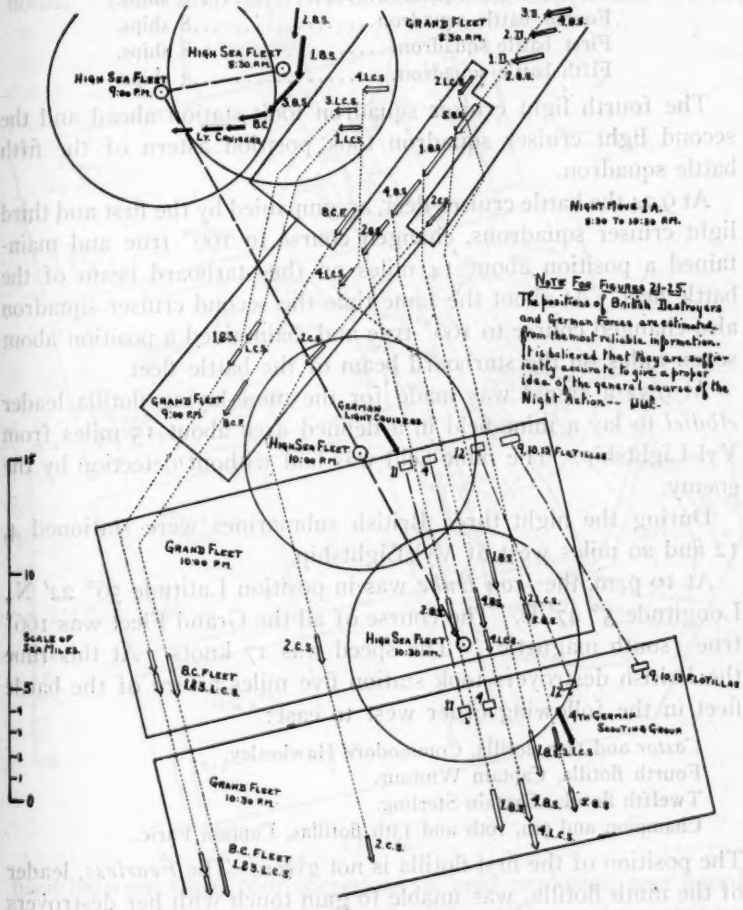

GRAND FLEET 8.30 P.M.
HIGH SEA FLEET 8.30 P.M.
HIGH SEA FLEET 9.00 P.M.
LT. CRUISERS
B.C.
B.C.F.
GRAND FLEET 9.00 P.M.
NIGHT MOVE 1A. 8.30 TO 10.30 P.M.
NOTE FOR FIGURES 21-25.
The positions of British Destroyers and German Forces are estimated from the most reliable information. It is believed that they are sufficiently accurate to give a proper idea of the general course of the Night Action.
GERMAN LIGHT CRUISERS
HIGH SEA FLEET 10.00 P.M.
9, 10, 13 FLOTILLAS
GRAND FLEET 10.00 P.M.
HIGH SEA FLEET 10.30 P.M.
SCALE OF SEA MILES
B.C. FLEET
4TH GERMAN SCOUTING GROUP
GRAND FLEET 10.30 P.M.
B.C. FLEET

FIG. 21.

to the westward it is probable that this movement was continued until at least 9, as the Germans could have had no desire to change course to the southward, which would bring them into action again.

At 9 p. m. Admiral Jellicoe signalled for the battle fleet to change course by divisions to 166° true, informing the other forces and

instructing them to take a similar course. Soon after this the battle fleet was ordered to take up the "second organization." This formed the battle fleet into four parallel columns at intervals of one mile. The order of battle squadrons from west to east was:

Second battle squadron.....8 ships.
Fourth battle squadron.....8 ships.
First battle squadron.....8 ships.
Fifth battle squadron.....3 ships.

The fourth light cruiser squadron took station ahead and the second light cruiser squadron took position astern of the fifth battle squadron.

At 9.24 the battle cruiser fleet, accompanied by the first and third light cruiser squadrons, changed course to 166° true and maintained a position about 14 miles on the starboard beam of the battle fleet. At about the same time the second cruiser squadron also changed course to 166° true and maintained a position about seven miles on the starboard beam of the battle fleet.

At 9.32 a signal was made for the mine-laying flotilla leader *Abdiel* to lay a mine-field in a defined area about 15 miles from Vyl Lightship. The mine-field was laid without detection by the enemy.

During the night three British submarines were stationed 4, 12 and 20 miles west of Vyl Lightship.

At 10 p. m. the *Iron Duke* was in position Latitude 56° 22′ N., Longitude 5° 47′ E. The course of all the Grand Fleet was 166° true (south magnetic). The speed was 17 knots. At this time the British destroyers took station five miles astern of the battle fleet in the following order west to east:

Castor and 11th flotilla, Commodore Hawkesley.
Fourth flotilla, Captain Wintour.
Twelfth flotilla, Captain Sterling.
Champion and 9th, 10th and 13th flotillas, Captain Farie.

The position of the first flotilla is not given. The *Fearless,* leader of the ninth flotilla, was unable to gain touch with her destroyers and they consequently followed the *Champion.*

In the account of the various night actions Admiral Jellicoe's book will be considered as the final authority, but numerous additional details will be added from other accounts.

At 10.04 the *Castor,* dropping astern of her flotilla, sighted several ships which she thought to be battle cruisers. They were

actually German light cruisers, including the *Hamburg* and *Elbing*. The Germans covered the *Castor* with an accurate fire. The *Castor* was hit on the bridge and her radio damaged so that she could not signal during the remainder of the night to the vessels of her flotilla. The *Castor* and two destroyers, the *Magic* and *Marne*,

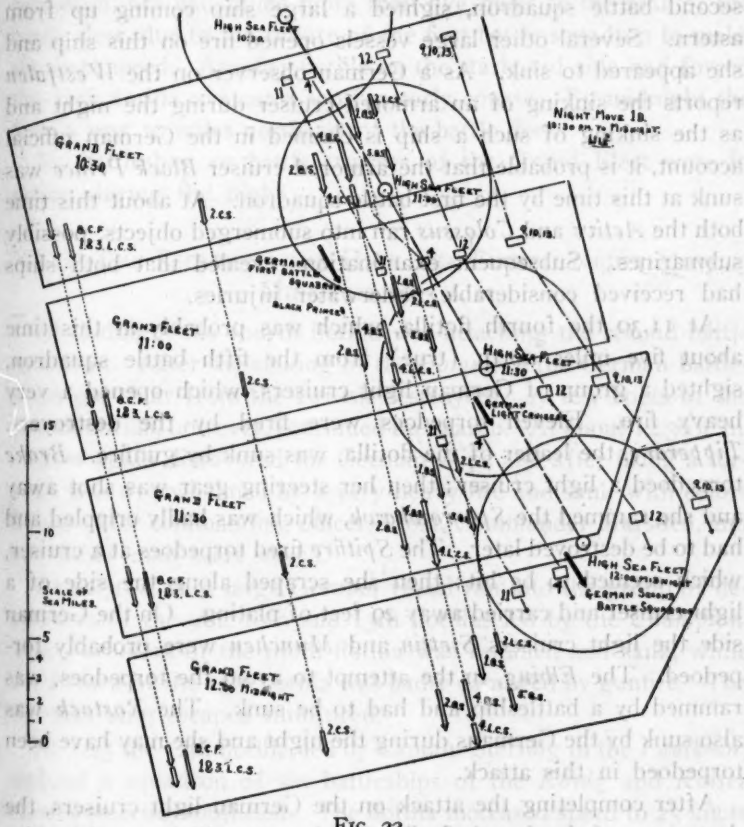


FIG. 22.

fired between them four torpedoes; a loud explosion was heard. The other destroyers of the flotilla did not fire as they were not sure that the ships sighted were German.

At 10.20 the second light cruiser squadron, which was in position astern of the fifth battle squadron, sighted one cruiser and four light cruisers, probably of the fourth scouting group. For 15 minutes a very fierce engagement took place. The German fire was very rapid and accurate and the two leading ships,

Southampton and *Dublin,* received many casualities. Three fires broke out on board the *Southampton.* This ship fired a torpedo at a group of searchlights, hitting the light cruiser *Frauenlob,* which quickly sank.

At 11 p. m. the light cruiser *Active,* which was astern of the second battle squadron, sighted a large ship coming up from astern. Several other large vessels opened fire on this ship and she appeared to sink. As a German observer on the *Westfalen* reports the sinking of an armored cruiser during the night and as the sinking of such a ship is claimed in the German official account, it is probable that the armored cruiser *Black Prince* was sunk at this time by the first battle squadron. At about this time both the *Active* and *Colossus* ran into submerged objects, possibly submarines. Subsequent examination revealed that both ships had received considerable underwater injuries.

At 11.30 the fourth flotilla, which was probably at this time about five miles north (true) from the fifth battle squadron, sighted a group of German light cruisers, which opened a very heavy fire. Eleven torpedoes were fired by the destroyers. *Tipperary,* the leader of the flotilla, was sunk by gunfire. *Broke* torpedoed a light cruiser; then her steering gear was shot away and she rammed the *Sparrowhawk,* which was badly crippled and had to be destroyed later. The *Spitfire* fired torpedoes at a cruiser, which seemed to be hit; then she scraped along the side of a light cruiser and carried away 29 feet of plating. On the German side the light cruisers *Stettin* and *Munchen* were probably torpedoed. The *Elbing,* in the attempt to avoid the torpedoes, was rammed by a battleship and had to be sunk. The *Rostock* was also sunk by the Germans during the night and she may have been torpedoed in this attack.

After completing the attack on the German light cruisers, the destroyers of the fourth flotilla which were still in condition for action continued on to the southeastward. At midnight they came in contact with a column of four ships of the *Deutschland* class belonging to the second battle squadron. The *Ardent, Ambuscade, Garland* and *Fortune* attacked, firing four torpedoes. The Germans opened their usual accurate fire and sank the *Fortune.* One or more torpedoes hit the *Pommern,* her magazine exploded and she sank immediately. Possibly other German battleships were hit.

The *Marlborough,* flagship of the first battle squadron, was not able to maintain the fleet speed of 17 knots, due to the damage caused by the torpedo hit she had received. She had probably dropped several miles astern of the battle fleet by midnight. The 12th flotilla had originally taken position astern of the first battle squadron, but had fallen more than five miles to the rear of the battle fleet, due to the failure of the first battle squadron to make the fleet speed. Another flotilla on the starboard side had forced the 12th flotilla to steer a southeasterly course. By midnight the flotilla was 10 miles northeast of the battle fleet.

No battleships or battle cruisers of the Grand Fleet were in action during the night.

XXII. The Escape of the High Sea Fleet. Night Move 2. Midnight to 3 a. m.

At midnight the fourth flotilla was attacking the second battle squadron. After the sinking of the *Pommern* the German battleships got clear from the British destroyers. A few boats of the fourth flotilla, however, continued the search. At about 12.30 a. m. *Ardent* again discovered the German ships and after firing a torpedo was overwhelmed by a very heavy fire and sank with colors flying. Her commanding officer, Lieut. Commander Marsden, and one other man were saved.

At 12.30 a. m. a large German vessel ran into the group of destroyers of the 9th, 10th and 13th flotillas led by the *Champion.* The *Turbulent* of the ninth flotilla was rammed and sank, while the *Petard* of the 13th flotilla was badly damaged by gunfire. The German ship escaped uninjured.

At 1.45 the 12th flotilla, led by Captain Sterling in the *Faulknor,* sighted a squadron of six battleships of the *Konig* and *Kaiser* classes steering southeast. The flotilla increased speed to 25 knots and, gaining a favorable position ahead of the enemy by 2 a. m., attacked at the short range of 3000 yards. Fifteen torpedoes were fired. A violent explosion occurred on the third ship and she disappeared from view.

The *Maenad* had not been able to take part in this attack, but continued on after the enemy and at 2.25 fired torpedoes at the fourth ship in the column at a range of 4500 yards. A violent explosion occurred on this ship also and she disappeared. Two

German ships were surely hit in these attacks, probably the *Grosser Kurfurst* and *Markgraf*. Neither of these ships sank, due to the wonderful anti-torpedo arrangements of the German constructors. Apparently there were no losses on the destroyers during this attack, which was a most successful one.

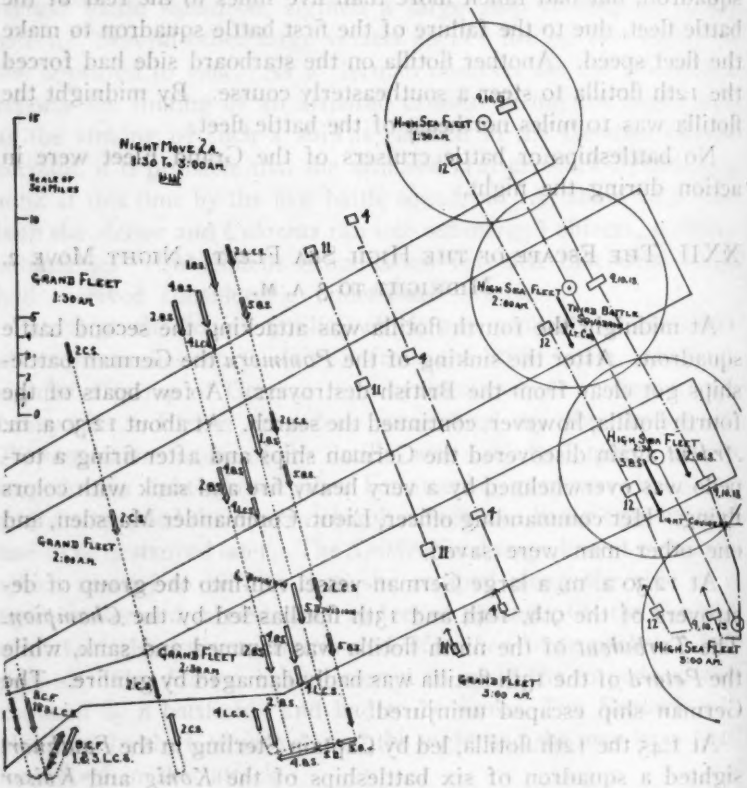


FIG. 23.

At 2.35 the *Moresby* of the 13th flotilla sighted four ships of the *Deutschland* class, belonging to the second battle squadron. One torpedo was fired and an explosion was heard later.

The destroyers had been seen in action during the night by the battle fleet. The Germans fired numerous star shells and frequently turned on searchlights, so that their approximate position must have been known to Admiral Jellicoe. Five torpedo explosions were recorded by a barograph on the *Malaya*, so that it

could have been known in the battle fleet that the destroyers were attacking with some success.

At 2 a. m. Sir Cecil Burney signalled to Admiral Jellicoe that he had been obliged to slow the *Marlborough* to 12 knots. Apparently the fifth division proceeded on with the fleet, while the sixth division stopped. Admiral Burney boarded the *Fearless*

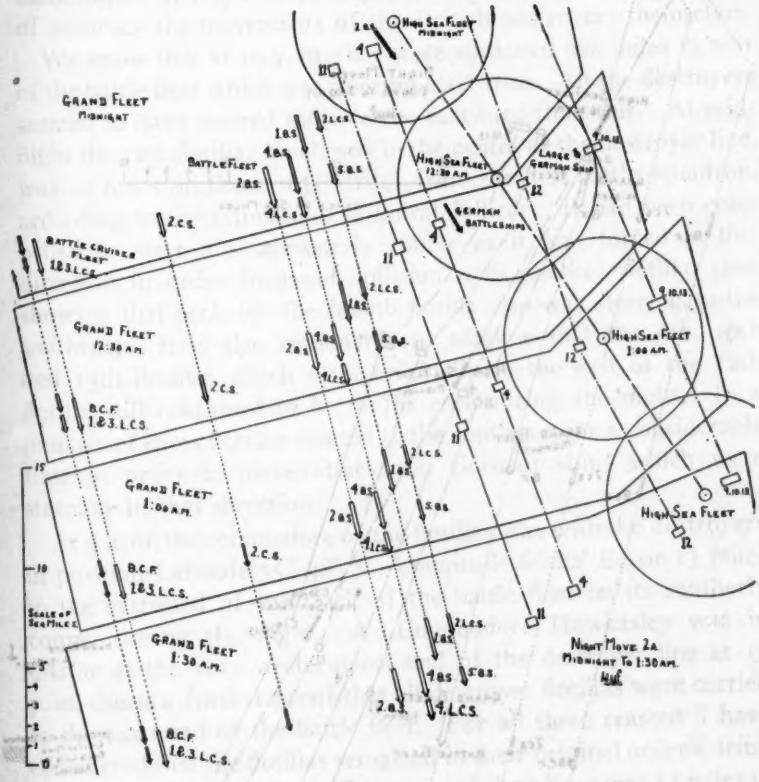


FIG. 24.

and shifted his flag to the *Revenge*. The *Marlborough* was ordered to a British base under the escort of the *Fearless*. It is probable that the exchange of flagships was completed at about 3 o'clock. The sixth division was not able to join the battle fleet until the evening.

At 2.47, just at daylight, the battle fleet formed single column on course 346° true. At the same time the second cruiser squadron

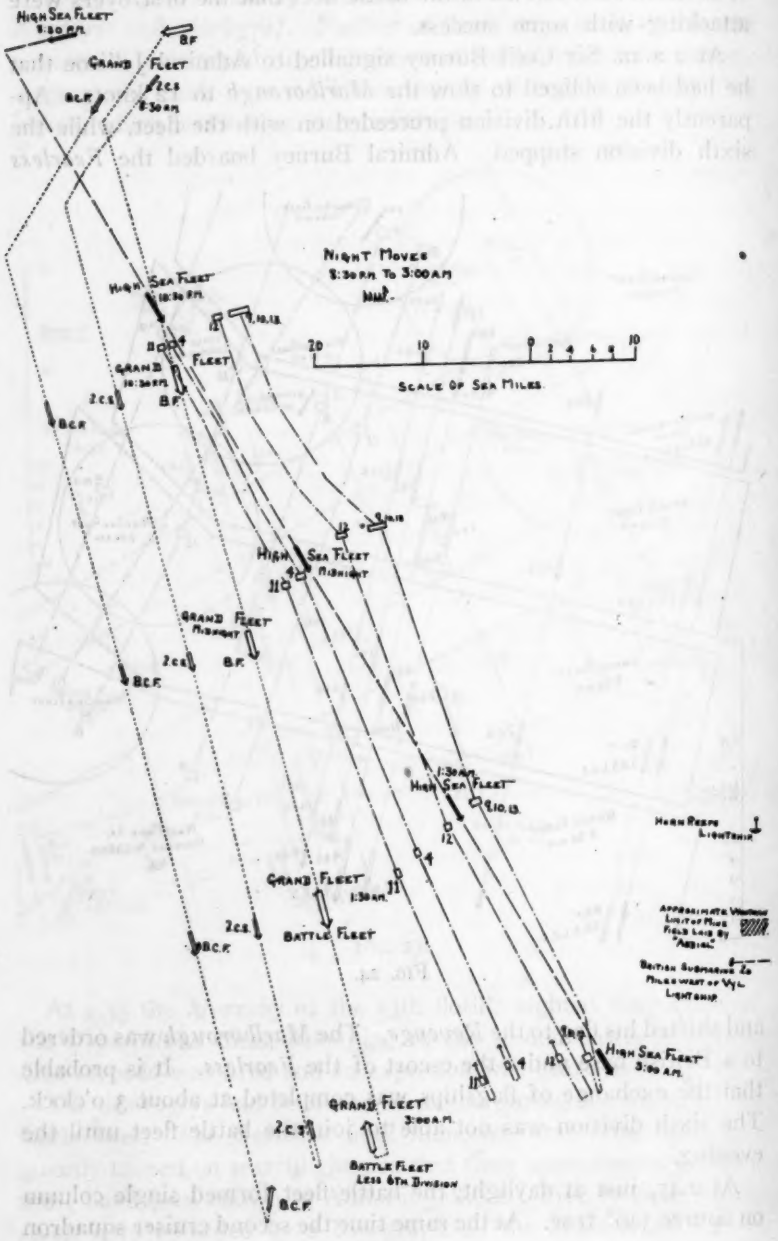

HIGH SEA FLEET 9:30 P.M.
GRAND FLEET
2 C.S.
B.C.F.
B.F.
8:30 P.M.
NIGHT MOVES
9:30 P.M. TO 3:00 A.M.
HIGH SEA FLEET 10:30 P.M.
GRAND FLEET 10:30 P.M.
SCALE OF SEA MILES
HIGH SEA FLEET MIDNIGHT
GRAND FLEET MIDNIGHT
1:30 A.M.
HIGH SEA FLEET
GRAND FLEET 1:30 A.M.
BATTLE FLEET
HORN REEFS LIGHTSHIP
APPROXIMATE WESTERN LIMIT OF MINE FIELD LAID BY "ARIADNE"
BRITISH SUBMARINES 20 MILES WEST OF V.L. LIGHTSHIP
HIGH SEA FLEET 3:00 A.M.
GRAND FLEET 3:00 A.M.
BATTLE FLEET LESS 6TH DIVISION

FIG. 25.

and the battle cruiser fleet turned to the northward. The visibility was very bad, its limit being three or four miles.

The movements of the High Sea Fleet during the night of 31 May have for long been shrouded in mystery. They can now be traced. The most valuable evidence is afforded by the contacts of the British destroyers with the German cruisers and battleships. It is therefore important to trace with some degree of accuracy the movements of the British destroyers themselves.

We know that at 10 p. m. they were stationed five miles in rear of the battle fleet which was steering 166° true. All the destroyers seemed to have steered more to the eastward than this. At midnight the 12th flotilla, which was in the center of the destroyer line, was 10 miles northeast (31° true) from the first battle squadron, according to the estimate of Admiral Jellicoe. It had been compelled to steer a southeasterly course as it was forced in this direction in order to avoid collision with another flotilla, thus showing that probably the fourth flotilla also was steering to the southeast. It is also reasonable to suppose that the 9th, 10th and 13th flotillas which were originally to the east of the 12th flotilla still continued to be to the east during the night. In a number of cases flotillas steered to the southeast for a considerable time in order to make attacks on German ships which were steering in that direction.

At 5 a. m. the commodore of the flotillas was with the destroyers in position Latitude 55° 48′ N., Longitude 6° 22′ E., or 13 miles to the eastward of the track of the battle fleet on its southerly course during the night. As Commodore Hawkesley was in *Castor* at the very westernmost end of the destroyer line at 10 p. m. this is a further proof that all destroyer flotillas were carried to the eastward of the battle fleet. For all these reasons I have considered that the flotillas remained in their original order during the night and that at 3 a. m. the center of their lines was 13 miles to the eastward of the track of the battle fleet.

The forces of the Grand Fleet made the following contacts with German cruisers and battleships during the night:

1. 10.04, *Castor* and German light cruisers.
2. 10.20, Second light cruiser squadron and the German fourth scouting group.
3. 11.00, *Active* and *Black Prince* with the German first battle squadron.
4. 11.30, Fourth flotilla and German light cruisers.

5. 12.00, Fourth flotilla and the German second battle squadron.
6. 12.30, *Ardent* of the fourth flotilla and the German second battle squadron.
7. 12.30, *Turbulent* and *Petard* with a large German vessel proceeding singly.
8. 1.45, Twelfth flotilla and German third battle squadron.
9. 2.25, *Maenad* of the 12th flotilla and German third battle squadron.
10. 2.35, *Moresby* of the 13th flotilla and the German second battle squadron.

You will note that all the German battle squadrons and probably all the scouting groups were sighted during the night.

The High Sea Fleet was seen by the *Falmouth* at 8.38 p. m. steering to the westward. The German official report states that the German divisions commenced a night cruise in "a southerly direction" after losing sight of the enemy. This night cruise then began about 9 p. m. Draw a line between the 9 p. m. and 2.30 a. m. positions—the contact of *Moresby* and *Maenad* with two German battle squadrons. The distance between these positions is approximately 100 miles, which could be covered in 5½ hours by a speed of 18 knots, the speed which the High Sea Fleet would most probably use. Now lay off on this line at half-hour intervals the approximate positions of the center of the High Sea Fleet, using speed of 18 knots. These positions are indicated on the sketches by small circles. It is reasonable to assume that the German forces would become somewhat scattered during such a night move. They would probably, however, be included in a circle of five miles radius. Circles are therefore drawn with this radius to show the areas covered by the High Sea Fleet at half-hour intervals.

It is interesting to note that all the 10 contacts reported come within circles drawn for the times at which the German forces were sighted. Many of these contacts are at the very center of the circles. I therefore conclude that at 9 p. m. the High Sea Fleet proceeded on course about 153° true at 18 knots. The battle fleet proceeded by squadrons or divisions. The scouting groups were ahead. At about 3 a. m. the High Sea Fleet passed the British battle fleet at a distance of about 20 miles and steering an opposite course. It passed Horn Reefs Lightship at a distance of about 25 miles. The British submarine 20 miles to the west of Vyl Lightship apparently did not sight the High Sea Fleet, thus confirming this conclusion. It is an interesting fact that the course

from the 9 p. m. position of the High Sea Fleet to Heligoland was 152° true.

The British directional wireless stations established the fact "that ships of the High Sea Fleet must have passed the Horn Reef on a southerly course shortly after daylight." Daylight was about 2.30 a. m.

The losses during the night and early morning were:

BRITISH		GERMAN		
Sunk	Damaged	Sunk	Torpedoed	Mined
Black Prince.	*Castor.*	*Pommern.*	*Markgraf.*	*Ostfriesland.*
Warrior.	*Southampton.*	*Rostock.*	*Grosser Kurfurst.*	
Tipperary.	*Dublin.*	*Lutzow.*	*Stettin.*	
Sparrowhawk.	*Broke.*	*Elbing.*	*Munchen.*	
Fortune.	*Spitfire.*	*Frauenlob.*		
Ardent.	*Petard.*			
Turbulent				

NOTE.—*Warrior* and *Lutzow* sank because of injuries received in the day action.

XXIII. OPERATIONS ON 1 JUNE

On 1 June Admiral Jellicoe made no attempt to renew the action. "The difficulties experienced in collecting the fleet (particularly the destroyers), due to the above causes, rendered it undesirable for the battle fleet to close the Horn Reef at daylight, as had been my intention when deciding to steer to the southward during the night. It was obviously necessary to concentrate the battle fleet and the destroyers before renewing action."

The High Sea Fleet arrived in their bases at noon; the *Ostfriesland* was mined during the return.

At 3.30 a. m. the battle fleet heard gunfire to the westward. At 3.38 a. m. the third light cruiser squadron reported that it was firing at a Zeppelin. At 3.44 a. m. the battle fleet headed 256° true by divisions and at 3.50 sighted the airship. The course was then again changed to 346° true. At 4.10 the battle fleet was formed in line of divisions on that course. At 4.25 the *Dublin* reported sighting a German light cruiser and two destroyers; these vessels were steaming fast and were soon lost in the mist.

At 5.15 the battle cruiser fleet joined the battle fleet and was directed to search for the enemy vessels reported by the *Dublin*. The battle fleet searched to the southeastward for a German battle cruiser which was thought to be damaged and well in rear of the High Sea Fleet.

The commodore of the flotillas reported that at 5 a. m. he was in position Latitude 55° 48′ N., Longitude 6° 22′ E. with destroyers.

At 7.15 a. m. the battle fleet altered course to 346° true and at 8 a. m. the battle cruiser fleet took the same course. During the forenoon the Grand Fleet cruised on various courses over the battlefield and 1.15 p. m. Admiral Jellicoe set the course for the home bases.

At 11 a. m. a torpedo was fired at the *Marlborough* as she was proceeding under escort of the *Fearless*. At 2.30 p. m. she was met by the destroyers of the Harwich force and arrived at the Humber at 8 a. m. 2 June, after a rather dangerous voyage.

At 8 a. m. the disabled *Warrior* was taken in tow by the *Engadine*, but as the weather became bad, she was abandoned and soon sank.

The disabled destroyers *Broke*, *Acasta* and *Onslow* arrived safely in port.

The Grand Fleet arrived at its bases on 2 June and at 9.45 p. m. that day was reported ready for sea on four hours notice. The conduct of the officers and men of the Grand Fleet had been splendid through the battle and, in the words of their commander-in-chief, "the glorious traditions of the past were most worthily upheld."

The losses of the Germans in killed and wounded was 3076, while those of the British were about 6600.

The losses in ships sunk and damaged were as follows:

SHIPS SUNK

BRITISH		GERMAN	
Queen Mary	26,350	*Lutzow*	26,180
Indefatigable	18,800	*Pommern*	13,200
Invicible	17,250	*Wiesbaden*	5,400
Defense	14,600	*Elbing*	4,500
Warrior	13,550	*Rostock*	4,900
Black Prince	13,350	*Frauenlob*	2,700
Tipperary	1,430	*V-4*	570
Nestor	890	*V-48*	750
Nomad	890	*V-27*	640
Turbulent	1,100	*V-29*	640
Fortune	965	*S-33*	700
Ardent	935		
Shark	935	Total	60,190
Sparrowhawk	935		
Total	111,980		

British Ships Damaged and Put Out of Action

Warspite .....Hit by about 30 large shells. Rejoined fleet during July.
Marlborough .....Torpedoed. Rejoined fleet about 5 August.

German Ships Damaged and Put Out of Action

Grosser Kurfurst....Hit by torpedo and four heavy shells. Engine damaged.
Markgraf .....Hit by torpedo.
Ostfriesland .....Badly damaged by mine.
Stettin .....Torpedoed.
Munchen .....Torpedoed.

In addition three British destroyers and a number of German destroyers were badly damaged and had to be towed into port.

British Ships Damaged but which Remained in Action

Lion .....Received a great number of hits. One turret out of action.
Tiger .....Received a considerable number of hits.
Princess Royal.....Received a considerable number of hits. One turret out of action.
New Zealand.....Probably received several hits.
Barham .....Five hits by heavy shells.
Malaya .....Eight hits by heavy shells.
Colossus .....One hit.
Calliope .....One hit by a heavy shell and other hits.
Dublin .....Numerous hits by small shells.
Southampton .....Numerous hits by heavy shells. 89 casualties.
Chester .....Very badly damaged by gunfire. Rejoined fleet 29 July. 81 casualties.

German Ships Damaged but which Remained in Action

Konig .....Hit 15 times by heavy shells and badly damaged.
Seydlitz .....Hit by 28 shells and one torpedo. One turret out of action.
Derfflinger .....Hit by numerous shells and badly damaged. Rejoined fleet before 19 August.
Oldenburg .....Bridge hit by small shell from destroyer.
Schlesien .....Injured by collision with *Schleswig-Holstein*
Moltke .....Three hits by heavy shells.
Von der Tann.....Five hits by heavy shells. One turret out of action.
Light cruisers.....Probably from three to five light cruisers were hit and slightly damaged.

I hope that I have succeeded in placing before you a clear and yet detailed description of the Battle of Jutland. You may now,

I hope with some reasonable degree of accuracy, trace the course of each squadron or division throughout a period of somewhat over 12 hours, from 2.20 p. m. of 31 May to 3 a. m. of 1 June. You are therefore in a position to judge for yourself the tactics of the British and German commanders and to tell which did the better from a tactical point of view.

But while the tactics of the battle are interesting from a technical viewpoint, the most important point is the effect of this battle upon the whole naval campaign and upon the entire war, that is, the strategical effect of the battle. Did the battle have a favorable effect for the Germans or the British, viewed from this broad viewpoint, or did it leave the strategical situation unchanged? You must decide upon this point from a careful consideration of what happened after the Battle of Jutland and until the end of the war, which was closed by such a complete and decisive success for the Allied Nations.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

FORTY YEARS AFTER

By A. B. CLEMENTS

It may be because we are growing old that we compare the old days with the present with unfavorable comment on the present, or it may be that we really observe shortcomings in present-day methods.

At the noon hour to-day I entered the room of my Naval Academy classmate B— who had remained in the service all these years, while I had spent almost 30 of them in civil life. I entered all smiles and said: "I have been visiting outside your door with Billy Caperton, isn't he a joy? Always the courteous, agreeable, pleasant gentleman, it makes you feel good all over to meet him." He answered, "Do you remember Caperton, Vinton and Stoney that first summer?" And then we were off into reminiscences of the old days and comparisons with the new that took up the whole lunch hour, and our talk, like many other talks of the old U. S. Naval Academy graduates of 40 years ago, was about the following:

That first day after we had taken the oath we were lined up on the deck of the old *Santee*, a motley crowd in our "cits," fair representatives of all sections. Kellogg of Rhode Island, Sloan of New York (eastern sophisticated city "men"), Marsh from Muncie, and Blish, Seymour, Indiana, Bonfits from a country town in Missouri, big Jim Drake from the corn-fields of Arkansas, "Bird" Wilkinson from a Louisiana plantation and Nat Saunders from the cotton-fields of Texas, but all Americans. Captain Merrill Miller addressed us as to our new positions and said about this: "Yesterday you were boys, to-day you are officers and gentlemen. You will be treated as such and expected to behave as such." How our blood tingled and our backbones stiffened up. "Officers and gentlemen," that was what we were. We were very young, the ages then were 14 to 18—but we were

"officers and gentlemen." Caperton, Vinton and Stoney were members of the graduating class who were retained at the Naval Academy to drill and instruct the "June plebes." We got into white working clothes and these three first-class men gave us our first instruction and our first drills. Merrill Miller, commander, and Caperton, Vinton and Stoney, midshipmen, gave us the first knowledge we had of what it really meant to be "officers and gentlemen," and we retain them all in loving memory. They were "officers and gentlemen," they treated us as "officers and gentlemen," and they required and expected us to live and conduct ourselves as "officers and gentlemen." As we look back on those days, the thing that looms big is the ideal of conduct and character expressed by "officers and gentlemen." We didn't then and don't now separate the words or the ideals they represent.

B— said: "I think in those days class standing meant more to us than simply learning our lessons, it meant making good. We were there to study and duty was to learn, high marks meant duty well done. We looked at it that way and the authorities gave our class standing weight in their consideration of us. If a man did not work and keep up we felt he had not made good. When he studied hard and began to pick up in his class standing we looked at him in a different light, he had our respect as one who had shown himself a success. Do you remember how we changed our opinion of Paris and Taylor when they began to go up in class standing? Though they were in the upper class we took note of it, the whole cadet corps knew of it and respected them accordingly." The atmosphere of the Academy was full of the idea of "officers and gentlemen," the idea of *noblesse oblige* was in the air. It was our duty to make good in our studies as it would be later to handle ships and govern men, all living up to the navy standard of "officers and gentlemen."

Again B— said: "Do you know, recently when some of the cadets were studying hard the remainder of the class compelled them to let up, they were making it too hard for the rest." Forty years ago that would not have been thought of, much less acted upon.

The superintendents of the Naval Academy in our day were Christopher Raymond Perry Rodgers, magnificent, imposing, polished, the Chesterfield of the navy, the most impressive figure of a naval officer I have ever seen, and Foxhall A. Parker, brilliant

officer, student, gallant gentleman, one of the most loved and admired officers of his day—and both of them embodying in appearance, character and conduct the high ideals of honor, patriotism and duty conveyed by the expression "officers and gentlemen."

The Academy was a place of work and study. Rice and Johnson were writing their calculus and initiating the course in naval architecture that, starting with Gatewood and Bowles, has given us the naval constructors that have made our modern navy. Hendrickson with Baker, Walker and others were investigating the mathematical theories of the old mathematicians, and the courses which they dealt with were being introduced to us as algebraic equations. Sampson was to us the embodiment of physical knowledge. I have never known his equal at explanation, and under him Munroe was beginning his investigation of the nitro substitution products from which he developed the smokeless powder which he gave to the navy. Michelson was measuring the velocity of light, the most authoritative up to that time and the model for all later determinations. Cit Terry was teaching Sprague, Emmett and Louis Duncan the elements of electricity. But why attempt to list the work being done when the heads of the departments were officers like Harrison, Howell, Sampson, Mahan, Schley, Hendrickson and Rice, and instructors and drill officers like Brownson, Knox, Ingersoll, Folger, Gridley, McCalla, Very, Roper, Knight and Caperton, they and their associates setting the example of duty and work, the obligation to make good? It is not strange that these men and this spirit, this ideal of "officers and gentlemen," produced Mayo, Benson, Sims and Wilson, among those who remained in the service, and Sprague, Emmett, Duncan, Hollis, Schell, Spangler, McFarland, Bowles, Hunt, Schwerin, Weeks, Weller, Semple, Kent and Scott, among those who went into civil life.

We had to work and we did work in those days, and our work then at the Academy was to study. Baseball, football and rowing were sports and recreations. We spent little time at balls and parties, class germans were unknown, our pay was $500 a year and we were allowed one ration, 30 cents a day, and we saved enough to pay Bellis and Brooks Brothers and Schuyler Hartley Graham and the rest of them for our outfits and we left the Academy with high hopes and empty pockets, but we did not carry a load of debt. We knew the Academy course, it was ours, we would not forget it. During the war with Germany I had to do with the

education of young men for commission and I often heard, "Well, I had that at college, I knew it then, but that was four years ago." We did not have to speak of our Naval Academy course in the past tense four years after or now after 40 years—we have it now. In the Officer Material School of the 12th Naval District it was attempted "that practical professional instruction shall cover the same ground as that given at the U. S. Naval Academy, together with such further practical work as the greater age and wider experience of these students may enable them to assimilate." The examinations were held by the permanent standing board of the navy yard and stations, regular navy officers in no way connected with the school, and the examinations were made so easy that a failure to pass was uncommon; of the last class from 61 who passed the physical examination only one failed, of the class before that from 56 who passed the physical examination none failed. Yet five months before I had called the attention to the easy examinations and suggested that they be made harder.

One of my early surprises when I came on duty in the reserve during the war was to hear an officer correct a yeoman (f.) who spoke of an officer as "that gentleman" and explain to her that she should say "that officer," but that she didn't know whether he was a gentleman or not. I smiled at what I thought was his joke, and then discovered it was no joke, that a new standard has taken the place of the old "officers and gentlemen," a new standard of efficiency, that the term "sea going" was a modern expression of commendation, and that "hard boiled" was also an appellation to be desired. I found out that the old jeer that naval officers were "college professors and dudes," with Sampson as the typical "college professor," and Dewey as the typical "dude," could no longer be made, that many young officers were taking the grommets out of their caps, leaving their shoes unpolished and generally cultivating an appearance and manner which would remove any probability of their being reproached as "dudes." It is a very old saying, "The apparel oft proclaims the man," and the advice "Rich be thy apparel as thy person afford" is still good. I fear that in the pursuit of efficiency, the appearance of hard work and readiness for toil may be mistaken for real efficiency, and that the departing from the old standards expressed by "officers and gentlemen" may cause the loss of that sense of *noblesse oblige* which made it incumbent to do thoroughly in spirit and truth the

duty at hand, and which would not tolerate "getting by," and which did not permit of "passing the buck." Emile Faguey of the French Academy, in his criticism of the spirit of democracy in France, has written of "The Cult of Incompetence" and "The Dread of Responsibility," and though he expressly disclaims any reference to American developments of the faults he criticises, and confines his criticism to France alone, nevertheless much of what he says applies as well to us, to the Naval Academy and to the navy. There is a pride, an aristocracy of effort and conduct, a standard of "officers and gentlemen" which is necessary to sustained effort and the attainment of high aims, and we must not lose sight of that truth and seek efficiency through surface appearance.

About 30 years ago I was talking with the son of Theodore Gary of the independent telephone companies, and asked him what he was going to be when he grew up. He answered, "I am going to be fat," and in answer to my "Why?" he said, "So I will have lots of money." That was the result of the observation of a boy of six, but the successful man he is to-day would not approve his early deductions.

As I think over our talk I question, is the Naval Academy and consequently the navy in growing bigger and more democratic also losing something of the high spirit that made for thoroughness? Is there a connection between unpolished shoes and soft-topped caps, and a brake on hard studying and the easy examinations? Is the appearance of being "sea going" and "hard boiled" only the outgrowth of the same sort of reasoning that caused young Gary to plan to be fat? Or, am I merely growing old?

MINUTES OF SPECIAL MEETING DECEMBER 19, 1919

U. S. NAVAL ACADEMY, ANNAPOLIS, MD.,
DECEMBER 19, 1919.

In accordance with Article XII of the Constitution, two months' notice having been given, a special meeting of the Institute was held in the board room of the Officer's Mess, December 19, 1919, in pursuance of the following notice:

UNITED STATES NAVAL ACADEMY
ANNAPOLIS, MARYLAND
17 NOVEMBER, 1919

NOTICE

TO MEMBERS OF THE UNITED STATES NAVAL INSTITUTE

A special meeting of the United States Naval Institute will take place in the board room of the Officers' Mess at the United States Naval Academy, on Friday, December 19, 1919, at 8 p. m.

The business of the meeting is the report of result of balloting on amendment to the Constitution regarding annual dues.

A large attendance is requested.

S. A. TAFFINDER,
Commander, U. S. Navy,
Secretary and Treasurer.

Captain W. T. Cluverius, U. S. Navy, Chairman of the Board of Control, presided and called the meeting to order at 8.35 p. m. The minutes of the annual meeting were approved. The Secretary reported the results of balloting on the proposed Amendment to Article XII, Section 8 of the Constitution as follows:

For the amendment	1293
Against the amendment	15

The adoption of the amendment was confirmed by the presiding officer.

There being no further business for presentation the meeting adjourned at 8.55 p. m.

S. A. TAFFINDER,
Commander, U. S. Navy,
Secretary and Treasurer.

ERRATA

U. S. NAVAL INSTITUTE PROCEEDINGS NO. 201

FREEDOM OF THE SEA

By Admiral Sir Reginald Custance, R. N., G. C. B.

TYPOGRAPHICAL ERROR

Page 1852, line 8 from bottom, the word " dependent " should read " independent."

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Membership

Life, regular and associate membership, 5591. New Members, 12. Resignations, 2. Dropped, 1. Deaths (2):

Lieutenant James C. Kress, U. S. Navy.

Rear Admiral Benjamin Tappan, U. S. Navy.

Dues

The annual dues ($3.00) for the year 1920 are now payable.

Regular and associate members of the U. S. Naval Institute are subject to the payment of the annual dues until the date of the receipt of their resignation.

Address of Members

All members are urged to keep the Secretary and Treasurer informed of the address to which PROCEEDINGS *are to be sent, and thus insure their receipt.* Members and subscribers are urged to notify the Secretary and Treasurer promptly of the non-receipt of PROCEEDINGS, in order that tracers may be started. The issue is completed by the 15th of each month.

Book Department

The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers.

Reprints of Articles

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Illustrations Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Notice Whole Nos. 6, 7, 10, 13, 14, 15, 17, 145, 146, 147, 149, 155 and 179 of the PROCEEDINGS are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 75 cents per copy.

ANNAPOLIS, MD., DECEMBER 15, 1919.

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PROFESSIONAL NOTES

PREPARED BY

LIEUT. COMMANDER WALLACE L. LIND, U. S. Navy

GENERAL ARRANGEMENT

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FRANCE

NEW CONSTRUCTION PROGRAM OF THE FRENCH NAVY.—On the occasion of voting the appropriations for the fourth quarter, M. Georges Leygues, Minister of the Marine, stated that the dreadnoughts of the *Flandre* type, laid down before the war, would not be finished, and that a new program of new constructions would soon be submitted to the Parliament.

This program—very limited as is appropriate, but very intelligent and modern—is now ready. It consists of the laying down of six light cruisers and of six destroyers.

The cruisers would probably be from 4000 to 5000 tons displacement; they are intended to be in accord with the teachings of the war. The destroyers are to be of a new type, very rapid and of great tonnage; probably 2000 tons.

The vessels of the *Flandre* type were the *Normandie, Gascogne, Languedoc, Flandres* and *Bearn,* designed by l'Ingénieur General Charles Doyore, du Génie Maritime.

It is doubtful if the *Bearn* ever was laid down.

THE NEW FRENCH SUBMARINE "LAPLACE."—TYPE "DUPUY-DE-LOME."—The large submarine *Laplace* will go into commission for her trials the first of November. This fine vessel, displacing 850 tons in the surface condition, was to have had as motors, geared turbines, but was finally equipped with two cycle internal-combustion motors, capable of giving a surface speed of 17.00 to 18.00 knots. Her quarters are greatly improved in comparison with previous types. The central station, especially, is quite unincumbered and very ample in space.

One of the principal qualities of this submarine is its extended radius of action. At a speed of 9 knots it is supposed to be nearly able to make twice the round trip from Rochefort to New York; at all events, her supply of petroleum will enable her to proceed to the American coast, there to cruise around from 3000 to 4000 miles and to return to Rochefort without

having the necessity of renewing her supply of combustible. Certainly, during this time, the submarine will lack sufficient provisions, as the space on board is insufficient for embarking a large quantity; but it is more convenient to obtain provisions than fuel.

The armament of the *Laplace* consists of eight 450-mm. (17.72″) torpedo tubes. These tubes are watertight and located, four forward and four aft. There will be in addition two reserve torpedoes on board. The battery which will be able to be directed against airplanes and balloons will be composed of two 75-mm. guns, one forward and one aft, installed in the center line of the vessel and capable of being drawn inside the vessel; each gun will have ammunition for 220 shots.

The complement of officers, which was to include, besides the commanding officer and engineer officer, two ensigns, will only include one of the latter, by reason of the present shortage of officers of this grade, a shortage which is going to continue to increase due to the opening of the Final Training School.

THE FRENCH ARMY.—The reading public in France, to judge by the articles of the last month or so in the French newspapers, has exhibited more interest in this matter than we see in our own country, and a moment's thought shows this to be a most natural thing. We on our side of the Channel have plumped for voluntaryism almost unanimously, and we knew all the time we should fall back to our previous custom. Therefore the British public has already dismissed the whole subject from its mind and is reverting to its old outlook of—that is the business of the government. But France is tied down forever to looking across the Rhine at a people whom she has good reason to suspect, whose population approaches the double of that of France and whose moral outlook bids fair to remain as incompatible as ever with the ideas and ways of decent folk.

One fight in France is going to be over the question of the future duration of service in the ranks under conscription. It was two years up to within a short time before the great war, and was then extended to three years, not because two years was coming to be reckoned a period too short for the production of a fully trained soldier, but because a projected increase in Germany's annual contingent called up for training was putting France in too marked an inferiority of troops for first line in the first days of mobilization and concentration. France's population in comparison with Germany's had been for years exhibiting so serious an ever-growing deficit that our ally had had, step by step, to reduce her annual exemptions, until it was practically the case that all her young men of fit physique were being called and trained. Therefore increase of the standing army was only feasible in France by keeping the men longer before returning them to civil life.

In Germany, on the other hand, there was a surplus who were being put back without training, though with liability. Out of these she was able to constitute without strain a larger contingent of recruits, producing the capacity for fresh first-line permanent army corps, besides being able to raise the war establishment of many units. France had to reply in the only way open to her, as stated above, and found herself in 1914 using the three-year system. Now she is looking into the needs of the immediate future.

There are two sides to the question—what our ally's finances can stand as an annual peace time charge, and what is the essential for defence on the best possible guess of Germany's real condition and of Germany's intentions. There is, of course, a third matter, but it is one of those "delicate" points which most Frenchmen will, as yet, at least, shrink from discussing or insisting upon. We have seen France during the negotiations at Versailles succeeding in gaining from us and from the United States a firm promise of speedy help in case of need. But speed is a relative idea, and help is bound up with the conception of quantity of force. The French Government, in settling its program, must not only look

at its condition of purse and at indications *outre Rhin*, but must calculate for British and American speed and for the amount, *en temps utile*, of their help. This last they must calculate from what we tell them of our intentions in the way of standing army and of the use we shall find it necessary to be making of it in normal times. The help our four or five British divisions gave them in August and September, 1914, ought to be of good augury, for several leading German authorities are themselves saying and writing of late that our reinforcement of "Old Contemptibles" it was that saved France in her early hour of greatest peril.

Our ally has hardly in hand as yet sufficient facts on which to work. We thus find her more important dailies still advising their public in the following rather hesitating manner: "Certain experts think it would be better first to lay down the plan of our military organization for time of war, and then to deduce from that the burdens that must be imposed in time of peace. This method would present the advantage of assuring for us the maximum chances of success if and when revived ambition on the part of our neighbors imposed on us a new conflict. We do not think this method ought to be alone employed. Alongside of the military needs, there exist economic necessities which the impoverishment resulting from five years of war renders more pressing than ever, and which must be faced as in the front rank. For that we must have on the nation's shoulders only the minimum of sacrifice in men, so as to leave available the greatest number of workers possible."

There is a great exaggeration in many people's minds in respect to the number of "hands" taken from industry by a system of compulsory military training. To hear some folks talk, one would think they envisage all the able-bodied men drilling instead of producing, but what are the facts? Taking 18 to 50 as the limits of fully-efficient manual labor, and one year or two years as the training period, you have each man doing 30 years' work to two years in the ranks, and you have the undoubted advantage of the practical value to the men of regular living, discipline and good feeding. In other words, you have 3,000,000 people working to every 200,000 at drill. It is not such a very serious deduction. We have surely a striking example in Germany for a generation before the war; her prodigious commercial and industrial expansion went on alongside of a very large conscription contingent, and even the French with their proportionately harder strain on man-power did not complain of the deduction of hands from industry, but of the cost to the budget.

What one has come to expect from a sounding of French opinion, as reflected in all classes of journals, is that France will have in future a one-year training system, with every man trained. A substantial permanent body of all ranks will be induced to re-engage by liberal terms of pay and pension as a training organization and a frontier guard in times of international tension. Above this there will be a general staff, kept at a high pitch of workmanlike ability, and not unduly whittled down at the call of an economical treasury which also will not be allowed the power it used to have of the ruthless cutting down of munitions and equipments.—*The Army and Navy Gazette*, Oct. 15, 1919.

WAR-TIME VICISSITUDES OF FRANCE'S SAILING FLEET.—With the exception of Norway, France at the outbreak of the war possessed more large sailing vessels engaged in long-distance trades than any other country in the world. This partiality of French vessel owners for this ancient form of shipping, which more progressive maritime nations have been rapidly discarding, is directly attributable to the passage in 1893 of a law granting very considerable subsidies to sailing vessels built in French yards and operated under the French flag. These subsidies were fixed on so high a scale that it was in the interest of owners of sailer tonnage to have their craft make as long voyages as possible. Thus as the subsidy paid was

gauged according to the number of knots traversed, vessels bound for the west coast of our continent chose to sail around the Cape of Good Hope rather than by the much shorter route around Cape Horn. Laden with wheat or nitrates, these vessels frequently did not return to France but made for a British or German port. The French Government, therefore, found itself in the position of heavily subsidizing sailing ships, which were engaged in furthering the trade of other countries.

The passage of a second act in 1902 reducing the amount of subsidy granted, unfavorably affected the firms owning French sailing ships so that they were in a more or less precarious financial position in 1914. Following the outbreak of hostilities, the state requisitioned or chartered all French sailing craft and employed them at first in bringing wheat from Australia and our Pacific Northwest. As they proved an easy prey for the German submarines lurking in French waters, these ships were then directed to the port of Dakar in French West Africa, where their cargoes were unloaded and suffered considerable deterioration before they could be transported farther. With typical official ineptitude, the French Commissioner of Transport then conceived the brilliant plan of employing these great sailing craft, constructed primarily for long-distance voyages, in the African coastwise trade, where they were constantly beset with calms and required oftentimes months to accomplish distances which steamers could traverse in a few days' time. As they were unable because of their size to approach near shore, the loading and discharge of these sailers proved a long and laborious task and led to further interminable delay. Others of these sailing vessels were loaned to our government when the United States entered the war in return for a proportionate number of American steamers assigned to the French.

Due to the hard usage to which they were subjected during the war years, the close of hostilities found many of the French sailing ships sadly in need of repairs. The French Government has undertaken to recondition them and, with this object in view, has directed them to certain of the French shipyards, where they are now floating idly with the tide. At the present rate of progress, the existing era of high freight rates may be a thing of the past before the majority of these stately craft are again ready to breast the seas. —*The Nautical Gazette*, Oct. 11, 1919.

GREAT BRITAIN

DEVELOPMENTS OF SEA WARFARE.—It was said last week in these columns, in regard to the navy of the present, that we must have a fleet in commission for the training of officers and men; we must have the material of the navy in reserve so disposed and organized that it can be brought into use within a reasonable time; and we must arrange that there is a personnel to complete crews for these ships which is not only adequate but can be mobilized smoothly and effectively. There is, however, one other "must" which cannot be omitted in the consideration of factors absolutely necessary to naval efficiency. There must be a permanent organization for continuous research and experiment in every field of naval construction and equipment and in all other spheres which concern the future development of sea warfare. Such a department, of course, would be in close touch with research organizations in all fields of science and invention. To instance one matter, the failure of our shells to penetrate German armor, mentioned by Lord Jellicoe, would have been provided against had a really efficient department such as is suggested been in effective working before the war.

Included in the *dossier* of such a department would be a survey of the energies of foreign admiralties, for the purpose of discovering in what respect our friends and rivals were applying the lessons of the war. It is already the business of the N. I. D. to supply this information. Such a survey without official assistance cannot but be perfunctory, but a glance

at the naval construction programs of foreign nations, so far as they are available, is not without interest in this connection. In America, the new building program was suspended in the spring, when Mr. Daniels decided to undertake his mission to Europe, and it does not appear to have been resumed, although a contract for the new capital ship *Massachusetts*, of over 40,000 tons displacement, was reported to have been signed in August. It will be interesting to have particulars of this ship, and also of the four Japanese capital ships, the *Mutsu*, *Nagato*, *Kaga* and *Tosa*, of which the first two are in a forward state, and to judge by their displacement of 32,000 tons and main armament of eight 16-in. guns, are intended to be improvements on the *Queen Elizabeth*. The Italians had in hand during the war four ships which might be similarly compared, of which only one, the *Morosini*, is understood to have been launched, but later information is to the effect that work has been stopped upon the class, and one of them, the *Cristoforo Colombo*, is being dismantled. Their design provided for a displacement of 33,000 tons, an armament of eight 15-in. and sixteen 6-in. guns, and a speed of 25 knots with oil fuel only. In France, battleship construction has been abandoned, at least for the present, and the modified program has as its main feature the building of six light cruisers and six 2000-ton destroyer leaders.

The fact is that probably never was opinion so varied in regard to the future capital ship. While Lord Fisher boldly declares that such a ship in the future will be useless unless she has the power of submersion, and Sir Percy Scott also affirms that the surface battleship is dead, Lord Jellicoe evidently considers that it will be expedient to continue battleship construction until it is clear what can replace it. Nor is it merely a question of battleships or no battleships. Whichever way that point is settled, other important problems arise. The French Admiral Daveluy considers that the capital defect of the "dreadnoughts" is that they are not protected against the torpedo and mine as they are against gunfire, nor adequately armed against submarine attacks. He suggests that a solution of these shortcomings lies in the adoption of forms altogether different from the traditional ones, but apparently does not admit the necessity of making the vessels submersible. The future ship must be armored, he affirms, for it will have to protect itself against enemy guns. But if given the power of going under water there should be a big reduction in the weight of armor necessary. While Admiral Daveluy draws attention to the precautions needed against mine and torpedo explosions, Rear Admiral W. F. Fullam, U. S. N., in a recent article in the *New York Herald*, lays stress upon the inherent weakness of the dreadnoughts owing to their unarmored decks. He shows how vertical or side armor, reinforced though it is by a lightly armored deck, offers little defence against long range or plunging fire and at the same time leaves fighting ships open to successful assault from the air.

This opens up the very important question in regard to our organization for maritime war, whether it is good policy to divide the aircraft arm from the navy itself. Lord Fisher appears to suggest that what will be wanted in the future navy is a predominant air force—submersibles and aircraft working together harmoniously. This forecast unquestionably indicates correctly the trend of development. Rear Admiral Fullam lays particular emphasis upon the principle that "sea power"—that is, the power to rove the sea at will with reasonable security and to deny its use to the enemy—must be largely dependent in the future on "air power," and a fleet which has lost such control may, despite any numerical and material superiority in surface vessels, be forced into an unfavorable position. If this is the case, it would seem to be essential that the same authority which is charged with the responsibility for the surface vessels operating oversea should also be made responsible for the aircraft operating oversea. A good opportunity for restoring to the navy its own air service arises in connection with the changes now on foot which have led

to Colonel Seely's resignation from the Air Ministry, and which have drawn from Mr. Walter Long the emphatic declaration that the establishment of a ministry for the navy, the army and the air would be, so far as the navy is concerned, nothing short of a disaster.—*The Army and Navy Gazette*, Nov. 15, 1919.

BRITISH IMPERIAL ANTARCTIC EXPEDITION.—Arrangements are now in hand for the organizing of another expedition to the antarctic region, and we would express our good wishes on the efforts being made to insure financial help to make the expedition successful and give all the comforts possible to those who embark on the quest of discovery and investigation. The enterprise and disregard of the privations manifested by the volunteers who venture to embark upon the voyage are worthy of esteem and deserving of support. The first vessel to cross the antarctic circle was under Jas. Cook in 1775, and from time to time since then other explorers have added their names to the list, the last being Sir Ernest H. Shackleton in 1914. In the view of the organizers of the forthcoming expedition, it is noted that few fields of commercial exploration are left which offer such wide scope as the antarctic continent, and the islands lying in its approach. The coast and the islands contain fine harbors, which in the northern parts can be worked for at least six months in the year. The climate is easier to live in than in Siberia or Klondyke. These lands are therefore not commercially inaccessible. Manganese, coal, granite, marble, and rubies have already been found there. Prof. David, Sydney University, New South Wales, an eminent authority on antarctic geology, has shown that geologically the Western Mountains of antarctica resemble the South American Andes, and has come to the conclusion from his researches, both in the antarctic and at home, that there is more than a possibility of finding gold. Having regard to these points, the expedition may be looked upon not only from the scientific, but from the commercial aspect, thus covering prospects for the development of trade in regions hitherto looked upon as beyond the reach of such. The objects of the expedition set before the organizers and their supporters are to ascertain the position and extent of the mineral and other deposits of economic value already known to exist in Antarctica (as per the scientific reports of Bruce, Mawson, Scott and Shackleton) and obtain data for the practical development as a further source of imperial wealth. 2. To obtain further evidence of the localities and migrations of whales of economic value, and to create British industries in this trade. 3. To investigate the meteorological and magnetic conditions in the Ross Sea area, and at Cape Arm (Enderbyland), in connection with their influence in similar conditions in Australasia and South Africa respectively. That such results are of great economic value has been proved by the station established by the Argentine Government for similar purposes in the South Orkneys. 4. To circumnavigate the antarctic continent. 5. To generally extend our knowledge of anarctica, especially with the view to obtaining further scientific data of economic importance.

It is proposed to leave England at the end of June, 1920, for Wellington, New Zealand, and then proceed to Macquarie Island, about October, where a geological survey will be made. The ship is then to proceed to Scott Island to establish a wireless and meteorological station. It is then intended to steam southwards, making continual oceanographical investigations for the Ross Sea, and seek a suitable harbor in the Western Mountains somewhere in the foothills between Granite and New Harbours. It is expected that New Harbour will be the most suitable point at which headquarters can be established.

The vessel which has been booked for the expedition is the well-known *Terra Nova*, whose keel has on former explorations in the same regions passed through antarctic waters. An aeroplane is to form part of the equipment, and will form a valuable auxiliary. We note that the chief engineer engaged for the expedition, Mr. Larkman, a member of the Insti-

tute of Marine Engineers, was in the last expedition, so that he knows from experience what is before him. A good enterprising second engineer and juniors, who are inclined to face the rigors of the enterprise, are required to make up the complement. The program for the expedition covers a period of five years. The wireless installations on the ship and at headquarters will enable the explorers to keep in touch with their own sections and with the homeland—a great advantage and comforting assurance to all interested.—*The Marine Engineer and Naval Architect*, November, 1919.

NAVAL REDUCTIONS.—In the three months from the end of July to the end of October, that is to say, between the date of Mr. Long's speech on the navy estimates and the review of the financial situation by Mr. Austen Chamberlain, the Chancellor of the Exchequer states that there has been a saving on the navy, compared with the previous Admiralty plans, of from £16,000,000 to £20,000,000. Whereas the personnel strength in July was 180,000, it is now 167,000; and in addition to the 10,000 temporary and reserve ratings in this latter total who will have been demobilized by December 31, the strength of the permanent service will also have been reduced by the ordinary processes of discharge and wastage from 157,000 to 146,000 by the same date. Though these reductions may not seem so imposing or drastic as those in material, they are probably more so in the long run, since the number of officers and men influences the majority of other votes, and when it falls, several recurring charges are cut out. All this is to the good, because from the national point of view retrenchment is very essential. At the same time, it is well to remember three things which are absolutely necessary to naval efficiency. We must have a fleet in commission for the training of officers and men; we must continue to have the material of the navy so disposed and organized in reserve that it can be brought into use within a reasonable time; and we must arrange that there is a personnel to complete crews for these ships which is not only adequate, but can be mobilized as smoothly and effectively as the latter. There may be fields for further reductions in the administrative offices, and centers of construction and maintenance like the dockyards, which can be utilized for other purposes of greater national importance at the present time. But given that only just sufficient vessels are kept in commission to provide for the training of the personnel, we may be said to have arrived at the irreducible minimum consistent with safety. Assuredly Lord Beatty, whose experience is second to none, will envisage this and make it his aim to maintain it against any further reductions of a vital character.—*The Army and Navy Gazette*, Nov. 8, 1919.

NAVAL NEWS.—The Admiralty announces that four Bolshevik destroyers attempted an attack on Esthonian vessels and British destroyers lying in Kuporia Bay. Two Bolshevik destroyers were sunk, six survivors being rescued. There were no British or Esthonian casualties. Kuporia Bay is several miles west of Krasnaya Gorka, a coast fortress still held by the Bolsheviks. The raiding destroyers came, of course, from Kronstadt, which, according to Helsingfors reports, was bombarded by British ships on Sunday.—*The Army and Navy Gazette*, Oct. 25, 1919.

SUBMARINE DETECTORS.—It is only natural that provision should be made on a peace basis for the continued training of seamen in the work of detecting submarines. A new rating of "submarine detector" has been instituted to be held by men from the seamen class after passing through the listening school established at Portland last year, and the numbers in the new branch are fixed for the present at 60. The arrangements for selecting men for this special work appear to be such as to insure that only the best, both mentally and physically, will hold the new rating. Volunteers must undergo, in the first instance, a special aural test, conducted by the

medical officer of the *Sarepta*, depot ship of the school, in conjunction with the medical officers at the naval depots, and the course at Portland will apparently last three months. Undeterred by some of the reports of submarines being abolished by international agreement—reports which in the present state of things seem quite unlikely to be realized—the authorities have been well-advised to proceed with the building up of a submarine detector personnel. It has been clearly shown by the French and British Listening Schools that the aptitude of men for this work can be cultivated and developed, but the process is necessarily a gradual one. Probably we owe the existence of a proper organization for it in our navy to the unrestricted submarine warfare of the Huns, for listening apparatus was scarcely mentioned during the first three years of the war, and only after the onslaught on our merchant shipping had reached its climax was the great value of the hydrophone fully demonstrated.—*The Army and Navy Gazette*, Oct. 11, 1919.

THE ACCIDENT TO "K-13."—*K-13* was one of two vessels of the double-hull type ordered from the Fairfield Company late in 1915. She was noticeable on account of her size and method of propulsion, being over 330 feet in length, of 2600 tons displacement, and being fitted with water-tube boilers and steam turbines for surface propulsion. For under-water work she had the usual storage batteries and electric motors. She had (Figs. 1 and 2) the following 11 compartments, from forward: Auxiliary ballast tank; bow torpedo room; officers' quarters with fore hatch; control room with conning-tower and wheel-house over, and double match; torpedo room with torpedo hatch; boiler room; turbine room with two hatches; motor room with hatch; crew space with hatch; steering compartment; ballast tank. On the starboard side of the boiler room was a watertight passage connecting the turbine room and the torpedo compartment. At each end of this passage was a watertight door and, midway, a bullseye looking into the boiler room. There were in all nine watertight doors. She had two periscopes, two wireless masts, two 10-ton drop keels, two funnels, two funnel covers worked by motors and clipped by hand, and four 36-inch boiler-room ventilators having mushroom covers. Her normal crew numbered 52 including officers.

She carried out preliminary trials on December 29, 1916, official speed trials on January 18, 1917, and preliminary submergences at Fairfield on January 6 and January 17. On Saturday, January 20, she carried out a successful dive to a depth of 65 feet in the Gareloch and remained submerged for about an hour. On Monday, January 29, 1917, she proceeded to Gareloch to carry out her acceptance trials, and made a successful dive to 83 feet, remaining submerged for about two hours. All men not required during this dive were put on board the tender, *Comet*, for lunch. The ship was duly accepted, but as the boiler room had been too hot during the dive to enable the watertightness of the funnel covers and boiler-room ventilators to be checked, another short dive of about a quarter of an hour's duration was asked for and decided upon. The remainder of the party and Mr. Cleghorn and Mr. Macmillan, directors of the company, had lunch; the latter, who had been on board during the earlier dive, went on board the *Comet*, and Mr. Macmillan had to go ashore to make arrangements for docking.

On board at the time of diving there were 55 naval officers and ratings; 11 Admiralty and sub-contractors' men; 14 Fairfield officials, standing-by only, the ship being worked entirely by her own crew—80 persons in all.

The day was fine and balmy, there was no wind, and the tide was high. The vessel lay near the shore a short distance from Shandon Hydropathic, and as she began to trim for her dive, with all the crew at diving stations, the *Comet* was proceeding towards Shandon Pier. The hatches were all closed, and so reported, and the illuminated signal "Engine-room Closed" signifying that hatches, funnels and ventilators had been closed down,

was seen to be so set, by those in the control room. Captain Herbert, after a last look around, closed down the conning-tower hatch and ordered half-speed ahead on both motors. When a suitable position had been reached, opposite Shandon Hydro, he gave the order to submerge, the hydroplanes were set to diving angles and the vessel gradually sank below the surface.

Almost immediately, those in the control room became aware that something was wrong, as the depth gauges showed that the vessel was sinking much more rapidly than was intended. Our ears became oppressed and deafened, showing that the air was becoming compressed. Orders were at once given to blow all tanks and come to the surface. In spite of this the vessel continued to sink rapidly.

Things now began to happen in quick succession. Orders were given to close all watertight doors and to let go drop keels, this being the first thing that made us realize that the matter was a very serious one. Mr. Hepworth was in the boiler-room passage when submergence began and, through the bullseye in the side of the passage, saw water pouring into the boiler room. He rushed first to the engine room and then back through the passage towards the control room to report this, and was one of the last men to get through the watertight door between the passage and the amidships torpedo room before it was shut. Mr. Struthers, was actually the last man to pass through before the door was shut; in fact, the closing of the door was delayed for a few seconds to let him through. Two men were shut off in the amidships torpedo room.

Three voice pipes led from the control room to the after portions of the ship, and the valves on these were closed as quickly as possible, but before this could be done, a jet of water came through one of the pipes and, discharging on to the switchboard, caused short-circuiting, bursting of fuses and ignition of cables. The control room became filled with white choking smoke. A sack was hurriedly pushed into the voice pipe, to stop the rush of water until the valve was closed. Meantime, the depth gauges showed in quick succession 20 feet, 30 feet, 40 feet, 50 feet, and finally 55 feet, when the vessel came gently to rest on the bottom with a slight list to port and an inclination of about four degrees up by the bow (Fig. 1). The depth was afterwards found to be 64 feet to the gauge corresponding to a pressure of 28½ pounds per square inch; 55 feet means 24½ pounds; the difference of four pounds was due to the compression of the enclosed air, and showed that the absolute internal pressure was about 19 pounds or 1¼ atmospheres.

The pungent smoke from the burning cables was rapidly filling the control room, irritating eyes and throat; we were all half dead owing to the high air pressure, and it was with difficulty that orders could be heard. The burning cables were at the back of the switchboard, and any attempt to smother the flames by means of wet sacks applied by hand were frustrated by the electric shocks received from the highly-charged switchboard. A chart table drawer was hurriedly smashed and some time was spent extinguishing fires by poking wet sacking on to the burning cables by means of splinters of the drawer bottom.

Stock could now be taken of our position. Repeated telephone calls to the engine room met with no response, and we feared the worst for our comrades in that portion of the ship. A considerable quantity of compressed air was expended in blowing water from the forward tanks, but no effect was produced on the air bubble indication of trim, and as our reserve of compressed air, already largely used up by the earlier dive, was running low, these efforts were stopped. Luckily our batteries were very fully charged, and we were able to use current freely for lighting, pumping and air compressing. The compressors were run for a short time to reduce the air pressure in the hull and to relieve our ears. This, no doubt threw additional strain upon the after bulkhead of the space free of water, but it successfully bore this extra load. We were unable to blow any water or oil out of the after tanks as the valves controlling these were all in the

engine room out of our reach. Nor could the after drop keel be released, though the forward weight was free.

As it happened, the captain of *E-50*—which was in the Gareloch on diving trials, had been watching our dive and "did not like the look of it." He dropped a buoy to mark the spot, and came over to meet *Comet*, which was now returning to stand by.

Shortly after settling down, we began to open the watertight doors again to obtain more room and more air. The watertight door leading to the submerged torpedo room was cautiously opened, releasing the two men who had been shut in. The compartment found to be practically free of water, though its after bulkhead, constructed to withstand a pressure of 15 pounds per square inch and now enduring nearly 25 pounds, was leaking freely and a considerable quantity of water was coming through the voice pipe, and the glands for cables, telegraph shafting, etc. Meantime, water was gaining at the rate of about two feet per hour in the amidships torpedo compartment, and at intervals the electric bilge pump had to be run for short periods to eject this.

Those in the forward portion of the ship were: Captains Herbert and Goodhart, Lieutenants Singer and Rideal; Messrs. Searle, Cocks, Renfrew, Black, Wallace, Hepworth, Hancock, Duncan, Hood, McLean, Skinner, Struthers, Bullen, Green, Kerr, Hillhouse, Lake, Powney, and 26 naval ratings. For these 48 persons the available air space was about 12,000 cubic feet giving about 250 cubic feet of air per person. Air contains about 20 per cent of oxygen, and if this be reduced to 16 per cent human life is extinguished. Each of us had, therefore an allowance of oxygen equal to 4 per cent of our air ration, or 10 cubic feet of oxygen per head. Now a human being at rest consumes about two-thirds of a cubic foot of oxygen per hour, and at this rate we should have been able to live for $10 + \frac{2}{3} = 15$ hours. If we had to work, the rate of consumption of oxygen would be very much greater, hard work involving a consumption nine times as great or 6 cubic feet per hour. Most of us had nothing to do, and I assume that we were using oxygen at an average rate of about 1¼ cubic feet per man per hour. At this rate, unless the air could be renewed, our allowance of oxygen would last only eight hours.

We actually carried on for about 42 hours on what air we had. This we were able to do by drawing upon our compressed air supply, and at intervals Mr. McLean allowed a small quantity to escape into the torpedo room and at the same time forced some of the vitiated air back into other bottles by means of the air compressor. On Tuesday the air was so bad that a match when struck produced only a slight smoke but no flame. As the oxygen was used its place was taken by the carbon dioxide exhaled. One per cent of CO_2 is distinctly smellable, and produces dyspnœa (which is what the medical men call panting); at 3 per cent the panting becomes painful, and at 5 per cent all exertion becomes impossible. As the air in our submerged prison became more and more impregnated with carbonic acid, so did our breathing become more and more difficult, and we had to inhale and exhale with painful rapidity. For some the process was carried on only under great pain and difficulty. Many found standing the easiest posture. And so the long night passed away.

When day broke, about 8 o'oclock on Tuesday morning, we could see a greenish light through the periscope. Some specks on the glass gave the illusion of a light green sunlit sea with a man rowing in a small boat, and it was only the immobility and constancy of the picture that assured us of its unreality. Through the bullseyes in the sides of the conning-tower we could distinctly see the wire guard rail which ran around the topsides.

At the time of the accident the hydraulic system, which worked the periscopes and the wireless masts, was running on the after pump in the engine room. This was disconnected (someone kindly advancing half-a-crown to be used as a blank flange), and changed over to the forward pump.

About 8 o'clock we heard heavy footsteps and tappings on the outside of the hull. But so drugged were we by the bad air that we had become almost indifferent, and the knowledge that help was at hand roused no enthusiasm, not even a cheer. We tapped back again, and tried to establish communication by means of the Morse code. But for some reason this did not go very well and no messages were conveyed beyond knowledge to us that we had been found and news to the surface that someone within the vessel was still alive. The diver departed, and we had another long spell of waiting, with occasional startings of the pump to clear water from the amidships torpedo room. This was necessary both to reduce the weight in the boat and to prevent the water from ultimately reaching the batteries under the control room. And now our two brave commanders Herbert and Goodhart, who had been earnestly conferring with each other over our desperate situation, made up their minds that one of them should endeavor to reach the surface by way of the conning-tower, and as the captain of a ship is supposed in all cases of abandonment to be the last to leave, Commander Goodhart undertook to make the attempt. The conning-tower (Fig. 4) was a heavy brass casting, elliptical in horizontal section 5 feet 6 inches long by 3 feet 6 inches wide and 4 feet 6 inches high. It was reached from the interior of the vessel by way of a hatch having a watertight hinging cover opening upwards into the tower. The after portion of the roof was occupied by the exit hatch with a balanced watertight cover opening upwards into the chart room. The forward portion rose to a further height of 3 feet 6 inches in the form of a dome, 2 feet 6 inches by 2 feet, designed to carry the projector compass at a sufficient distance from the steelwork of the main hull. Each hatch could be opened and closed only from the underside. On each side was a glass bullseye fitted with prisms which enabled an observer to see ahead as well as on the beam.

There were fittings of many descriptions in the tower, but those of direct importance to the captain's plan were as follows: An electric lamp, suspended from the top of the dome; a fuel vent pipe, one inch in diameter, leading from below and cut through the after side of the tower, with a valve on the inside; the projector compass tube leading down to the control room and fitted with a valve inside the main hull; a high-pressure air pipe leading up to the whistle and fitted with valves inside the main hull and within the conning-tower (Fig. 4).

In preparation for the proposed escape, the vent pipe was removed below the valve, so that by opening the latter sea water could be admitted to the conning-tower. The projector compass and its tube were removed so as to leave more room in the tower and dome, and so that the lower portion of the pipe within the control room could be used as a drain pipe to carry away water from the conning-tower. A flexible hose was attached to the lower end of the pipe and led into the broadside torpedo room. The whistle pipe was broken at a joint and a valve taken from an inboard position was fitted on the upper end of the pipe leading from the high-pressure air system. By this arrangement compressed air could be admitted to the conning-tower by opening both the valves described—the new valve specially fitted within the tower and the original valve in the control room. The air could be shut off by either valve.

The commander's intentions were that both officers should enter the tower and close the lower door, which would be clipped from below. They would then unclip the upper door, open the sea valve and gradually flood the conning-tower, forcing up the air in it until its pressure became equal to that due to the head of sea water upon the upper door. This, being balanced, could then be easily opened, the two occupants of the tower standing with their heads in the dome from which the air could not escape. The water in the conning-tower at this time would be about three feet deep, but as soon as the lid was raised, the air above this level and below the dome would, of course, escape and be replaced by an inrush of sea water. High-pressure air was then to be turned on and, aided by its out-

flow, Commander Goodhart was to pass through the upper door and endeavor to find his way through the chart room door and swim to the surface. As soon as he had gone Herbert was to shut off the air supply,

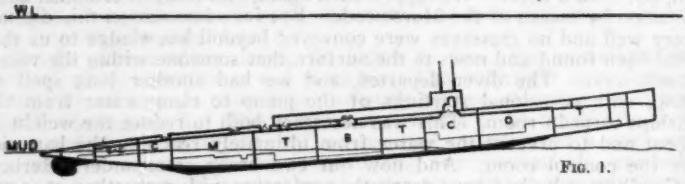


FIG. 1.

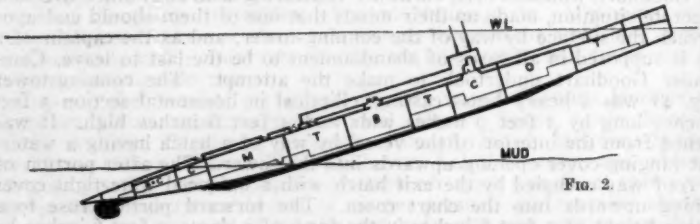


FIG. 2.

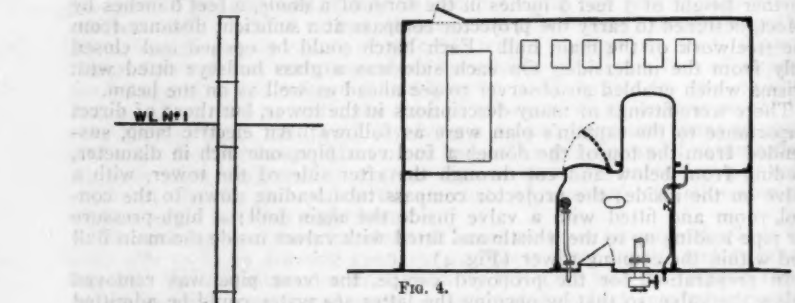
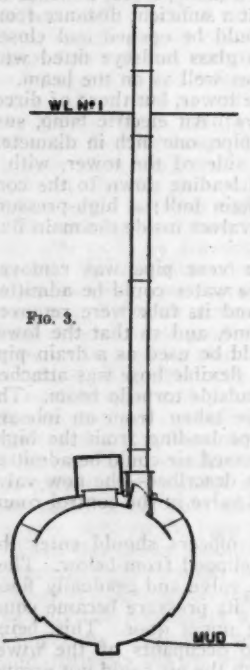


FIG. 4.

FIG. 3.



close and clip the outer door and knock loudly on the inner hull with an iron rod placed within reach for that purpose. This was to be the signal for those within board to open the drain valve, and as soon as this was

done Herbert could let a small amount of compressed air into the tower to take the place of the outflowing water and even to accelerate its going. Those within board were to watch the water flowing from the drain pipe and when it ceased to flow unclip and open the lower door and receive Herbert, who would meantime have closed the air valve, back into the vessel.

While these preparations were going forward, a small tin cylinder, which I had brought with me to hold a hydrometer, was prepared to carry a message to the surface in case Commander Goodhart himself failed in his attempt. Many of the prisoners wrote farewell messages to their people, and these were all given harbor in the cylinder. A list of the then survivors was also enclosed. It was a well-laid scheme, but like many such it went "agley."

We afterwards learned that the two commanders had opened the sea cock and had stood till the ice-cold water had reached their middles. Their ears were drumming and deafened by the high pressure of the air, a thick fog filled the upper space and rendered the electric light useless. Then the door was lifted, air turned on, Goodhart passed up through the hatch. Herbert stepped forward to close the hatch, but the rush of the expanding air was so great that in spite of himself he was forced upwards through the opening and into the wheel-house, and then by pure good luck was carried by the escaping air aft and up through the hatch in the after end of the wheel-house roof. He partly swam and was partly carried by the ascending air to the surface, breathing most of the time, and brushing aside the "wireless" wires as he passed. He came up close to the diver's boat, and the diver who was standing on his ladder with helmet off, grabbed him and helped him on board. Herbert's first words were "Where's Goodhart?" and we can imagine his horror when he was told that he had not appeared. Nor had the tin cylinder reached the surface, and long afterwards the brave commander, who truly gave his life for all of us, was found in the forward part of the wheel-house. It is supposed that he was shot violently upwards by the rush of air and was stunned by contact with the wheel-house roof.

Of all this, of course, we knew nothing at the time, though we speculated much, and settled down again to another period of waiting, broken only by periodical startings of the bilge pump and high-pressure air-compressor. Herbert's arrival on the surface was a godsend to us all, however, as he was able to give the rescue party definite details as to our condition and to advise as to the best means of assistance.

Our rescuers, with all the will and the resources of the *Clyde* at their disposal were terribly handicapped by want of exact knowledge of our circumstances. All that was known was that *K-13* had gone down and had not come up again, and that she was probably not at the bottom of the Gareloch from choice. When morning dawned divers and craft of all kinds were on the scene, and Captain Young, giant among salvors, and his famous salvage vessel *Ranger*, were en route from Holyhead. From the commencement of the war Captain (now Commodore Young, R. N. R.) was appointed H. M. Naval Salvage Adviser, and severed his connection with Liverpool for the duration of the war. The salvage ship *Ranger* was transferred to the navy, and became one of H. M. salvage ships. It so happened that H. M. salvage ship *Thrush* was at Greenock at the time of the accident, having just completed the salvage of the *Mavisbrook* at Loch Maddie, and this vessel proceeded at 6 a. m. the following morning for the scene of the accident, together wtih a number of other vessels, including two Clyde hopper barges and a trawler—the operations being then in charge of Admiralty Salvage Officer Commander Kay, R. N. R., until relieved by Captain Young, who arrived shortly after Commander Herbert came to the surface.

Wire ropes were placed under the bows of the submarine and attached to the two Clyde hoppers, and also from the salvage vessel *Thrush* to the

trawler on the opposite side. Many schemes were projected and discussed. The first object was to save life, and thereafter to salve the vessel herself. If, as appeared probable, the submarine was too heavy to be lifted by main force so as to bring her crew to the surface with herself, then the crew must be brought up without the ship. Captain Herbert suggested a rescue tube, and the necessary instructions reached Fairfield just after stopping time on Tuesday evening when staff and workers were homeward bound. Hasty calls were issued. A steel tube 27 inches in diameter and 60 feet in length, with a box at one end was at once made and arranged to be fitted over the outer hull in way of the 'midship torpedo hatch and caulked watertight (Fig. 3). This was to be fixed in place by divers and guyed to the hull. A discharge pipe was attached to its lower end and carried up to the surface on the outside. The top was to be temporarily closed by a bolted plate, and the water in the tube blown up the discharge pipe. The cover could then be removed so that someone—and preferably someone small—could be lowered and get us to open the torpedo hatch, when one by one we could have been hoisted to freedom. But it was not known if we were able to open the hatch, much less lift it, and so it was thought that it might become necessary to cut a hole in the cover. This would have to be done by means of the oxy-acetylene flame, and would be by no means a pleasant but in every way a risky job. All night the ironworkers and carpenters wrought at the tube, box and pipe; never perhaps had men worked so eagerly and so strenuously, and the whole was complete within 17 hours from the beginning of preparing drawings. The tube was never used, but none the less it was a noble effort, and might have been of vital importance.

The result of Herbert's efforts became evident to us at about 6 o'clock on Tuesday evening when we were made aware by tapping on the hull that a high-pressure connection had been made to our air system. There was a branch from the air system led outboard for gunnery purposes and to enable air for recharging the air bottles to be received from the shore or from another vessel, and to this a flexible air pipe had been connected. We slightly opened one of the joints in the system and cautiously opened the inboard valve. To our disappointment we obtained not the air we so much needed, but salt water mixed with a few air bubbles. We caught this water in buckets and removed bucketful after bucketful, hoping that we would soon come to an end of the water and get to the air. But at last we had to close the valve and try to tap out a message to say what was happening.

Then followed another long wait while the diver disconnected and overhauled his air pipe, to find the cause of the trouble in a blank flange where no blank flange should be. This was put right and we got pure dry air. A little of this was allowed to escape into the hull, and then the joint was made tight and we proceeded to recharge our exhausted air bottles. This was about 4 o'clock on Wednesday morning, when we had been below for about 37 hours. About this time the diver hung an electric lamp in front of the eye of the periscope. This Morsed messages to us—if we happened to be looking—but, of course, we had no means of signalling back. About 5 a. m., as soon as we had charged up several groups of bottles to their full pressure of 2500 pounds, we began to blow out all the forward tanks within our control, namely, the seven foremost external tanks and the internal tanks forward of the boiler room. As we had no means of knowing when these were emptied we had to guess how long to keep the air on each, but as our supply was now ample we made reasonably sure that each was completely blown before passing to the next.

Anxiously we watched the bubbles of our fore and aft spirit levels for some sign that the bow was lifting, but for a long time nothing happened. Tank after tank was given its quantum of air, but the bubble remained motionless at 4 degrees up by the bow. We had almost given up hope when we began to blow into almost the last remaining tank. And then the bubble moved! We gave a shout of delight, and watched the cheering indicator as it slowly moved to 5 degrees, 6 degrees, 7 degrees, 8 degrees,

9 degrees, 10 degrees, and that was as far as it was made to go—it could go on further. Wire cables had been passed under our bows from the salvage vessels and an attempt made to raise the submarine by this means, but without success—as our fore end lifted these cables were observed to slacken and were at once pulled taut so as to hold what we had gained. But the vessel continued to rise forward, the decks became steeper and steeper, until at last those on the surface saw our bow rise out of the water, and presently signalled to us that we were high enough and had better not blow any more as the escaping air was endangering the diver. At this time the vessel lay with her stern some 12 feet deep in the mud and her stem head about 10 feet above water, the angle of longitudinal inclination being about 16 degrees. When the bow was raised we could see clearly through the periscope, which was now above water, and watch the work of rescue, and we were able to recognize those on board the lighter (see Fig. 2).

The great inclination brought another trouble. The bilge pump was now raised so high above the after end of the torpedo room that it would no longer function. As we were in constant fear of the incoming water rising so high as to enter the control room and reach the batteries, we started to carry it in buckets to one of the forward bilges. This was a slow and wearisome process, as we had but two buckets—one of which leaked—and the steep and slippery deck made our footing very insecure. We formed a queue, each member of which held himself in place by one hand and passed the buckets along with the other. This work continued for some time, until Mr. McLean and Mr. Bullen hit upon a better plan. They took off the cover of the manhole to the tank under the torpedo room and allowed the bilge water to pour into the tank. When the tank was nearly full, the manhole was closed, high-pressure air admitted to the tank and all the water blown out. The manhole was then reopened and the process repeated as before. Incidentally this operation helped to renew our air, as each time the manhole was opened some of the compressed air in the tank expanded into our living spaces.

By this means the water was kept well under, and it never came near to the batteries, although at one time our rescuers by some misunderstanding were led to believe that we were in imminent danger of chlorination.

Meantime, another connection was made to the hull. There was a 7-inch ventilator and hand-up which passed through both inner and outer hulls from the officers' quarters. This had a screwed cover on top and a hinged cover below. The top cover was removed by the diver, a hole cut in it, and a 4-inch flexible armored hose securely attached. The cover was then replaced, and most of the water sucked out of the pipe by means of a smaller suction hose. Word was then tapped to us to open the hinged cover. This we did very cautiously, and found that after a considerable quantity of water had come down air began to rush strongly out of our prison, showing that the pressure was still considerably above that of the atmosphere. The escaping air was so black and foul that our salvors marvelled that any one could still be alive. The boiler-room bulkhead responded to the reduction of pressure by leaking more rapidly, but luckily did not give way under the additional load caused by the reduction of air pressure on its forward side.

We could now talk freely with those on the surface, and our first inquiry was for Herbert, as our impression was that Goodhart had reached the surface, but that Herbert was still in the conning-tower. He replied himself, to our great joy. It was not till much later that we learned that Goodhart had been lost.

The diver had found explanation of the disaster by discovering that the four air-inlets to the boiler-room were fully open. These should, of course, have been closed before the signal "Engine-room closed" was set in the control room, but by some oversight this had not been done. The accident

was thus not due to any defect in the design or construction of the vessel, but to a momentary forgetfulness on the part of someone who paid for his error with his life. When the vessel was ultimately examined, the lever controlling the air-inlet covers was found to be standing at "open."

The 4-inch tube, besides making communications as easy as they had previously been difficult, was large enough for the passage of small articles, and presently a small bottle of brandy was seen to be dangling on the end of a string. This was served round sparingly, the dish used being the brass cover of an electric switch. Next came milk and chocolate, liquid and solid. No one was anxious to eat; we had on board at the time of the accident a supply of sandwiches enough to afford about 1½ per person; these were passed round about 6 o'clock on Wednesday morning, but very few were eaten. Thirst was our principal trouble.

A high-pressure air pipe was passed down the 4-inch flexible hose. As the hull became filled with fresh air and the foul air was expelled, we all revived wonderfully, and hope began to speak again in a timid manner, though no one voiced his hope as it was felt that at any moment, and in any of many forms, disaster might come. All along we had had in our minds the possibility that we might have to retreat from the control room if the boiler-room bulkhead showed signs of giving way, and a good deal of work was done by Mr. Skinner and others in altering electric leads so that we might be independent of the switchboard and of the after battery under the control room. But the bulkhead held, and these arrangements did not have to be put into operation. While connecting a wandering lead to the starter of the air compressor one of the men accidentally made a short circuit, which blew out the main fuse and suddenly plunged the whole interior into darkness. The last 6 hours or thereabouts of our imprisonment were spent in total darkness, relieved only by one wandering lead from the switchboard, two magazine hand lamps and one electric torch.

Meantime, the problem of getting us out was exercising the minds of those on the surface. It was thought that we might possibly utilize one of the bow tubes as an exit, but when we cautiously eased the inner cover we found that the tube was fully flooded, and so had to screw the cover tight again. It was then decided to pump away the water lying between the main hull and the superstructure forward, to cut a hole in the deck and another directly below it in the main hull. Finally, a space just aft of the tank bulkhead was chosen. The oxy-acetylene flame was set to work and soon the anxious watchers below saw its point burst through the roof of their prison. A hole about 18 inches square was quickly cut, Lieutenant Singer gave the order, "Civilians first," and amid resounding cheers from the men crowding the decks of the rescue vessels we began to appear one by one out of the depths and on to the deck of the *K-13*. Forty-eight men came out. The last man to come out was, as it should have been, Lieutenant Singer, who, with Mr. Wallace and myself had gradually passed forward from compartment to compartment, carefully closing the watertight doors behind us as we made our way forward.

Stout steel hawsers had been passed under the *K-13* to help raise her how and to hold her up when raised. As water slowly leaked into her hull, and was no longer kept in check by the pumps, the strain upon these hawsers became so great that about 6 o'clock on Thursday afternoon the bollards were torn out of the supporting barges and *K-13* again sank to the bottom.

The salvage party closed up all openings in the inner hull and fitted to each compartment two pipes—an air supply pipe led from the surface and just through the crown, and a water discharge pipe led from the surface, passed through the top of each space and pushed downwards as near to the bottom as possible. The water was thus gradually driven out of the vessel, and about six weeks later she bobbed up as suddenly and as unexpectedly as she had gone down.

Two men were missing. They had evidently opened the engine hatch, the pressures on each side of which would of course be equal, and had managed to reach the surface, only to be overcome by the sudden reduction of pressure and to become unconscious and sink again into the Gareloch.

K-13 returned to Fairfield to be completely gutted out and renewed, and was before very long again passed as "fit for service."—*Engineering*, Oct. 31, 1919.

NEW RETIRING AGES IN BRITISH NAVY.—The British Admiralty announces the following reduction in compulsory retiring ages for medical officers, accountant officers, chaplains and instructors, which goes into effect January 1, 1920, and will be worked to gradually. For accountant and medical officers and instructors compulsory retirement will be—for captains, on and after January 1, 1920, 59, on and after January 1, 1921, 58, and on and after January 1, 1922, 57, on and after January 1, 1923, 56, and on and after January 1, 1924, 55. In the case of commanders during the same period, the retiring age will be reduced from 58 to 50, or at the rate of two years each year. Paymaster lieut.-commanders are to retire at 45 from January 1, 1920; surgeon lieut.-commanders and instructor commanders and instructor lieut.-commanders at the same age from January 1, 1924. Chaplains are to retire as follows: On and after January 1, 1920, at 58; January 1, 1921, 56; January 1, 1922, 54; January 1, 1923, 52; January 1, 1924, 50. From January 1, 1922, chaplains selected for retention beyond the normal age of retirement will retire at 55. For Royal Marine officers the new retiring ages are to be: Major-generals on and after January 1, 1920, 62, January 1, 1921, 61, January 1, 1922, 60; colonels commandant, January 1, 1920, 59, January 1, 1921, 58, January 1, 1922, 57; colonels second commandant, January 1, 1920, 57, January 1, 1921, 56, January 1, 1922, 55; lieut.-colonels, January 1, 1920, 54, January 1, 1921, 53, January 1, 1922, 52; reserve of colonels January 1, 1920, 59, January 1, 1921, 53, January 1, 1922, 57. Commandants will be allowed to retain their option of being transferred to the reserve list of colonels up to the age of 57 and will be eligible for promotion to the rank of major-general up to that age.—*Army and Navy Journal*, Nov. 8, 1919.

AN IMPERIAL FLEET.—In reference to Australia and Imperial Defence, we are glad to see that opinion in the Dominions so far as it has been expressed, appears to recognize the necessity of complete and harmonious co-ordination between all the naval forces of the Empire if they are to perform what is required of them in time of war. The Toronto *Globe*, one of the most influential of Canadian journals, put the case very well in an article recently when it said: "So long as the principle is recognized that each Dominion shall control its own naval defences there will be the heartiest desire in the Dominions to co-operate with the British authorities in standardization, and in every way that will enable the naval forces throughout the Empire to be welded into a unit in time of war. Efficiency alone requires that they shall be homogeneous, apart from sentiment, political unity, and common interests." This is the whole matter in a nutshell, and if the problem, which will naturally have its difficulties, is faced in this patriotic and practical spirit, it should be quickly solved.—*The Army and Navy Gazette*, Aug. 30, 1919.

JAPAN

JAPAN AS A NAVAL POWER.—Is Japan seeking second place among the naval powers of the world? To-day the need for self-protection being pressed home to each nation as the result of the world war, there seems to be a growing desire manifest for more naval strength among many of the great powers.

The elimination of Germany from the first ranks as a naval power raised the United States to second place, next to Great Britain, while other powers received a corresponding boost. Had Germany still remained a strong sea nation, the war construction of the United States and the projected building plans of both the United States and Japan would still have brought them closer to the head of the list.

When the United States found itself, as the result of war construction, able to bring a modern fleet to the Pacific Ocean and give protection to both coasts of the country, the new policy thus made prominent centered attention on the Pacific and made of interest the navies of other nations bordering on the Pacific, the comparative strength of fleets on this ocean and the naval importance of the Pacific resulting from its constant increase of commerce and its growing interest to the world at large on account of its opportunities for extended development.

In looking over the naval powers of the Pacific, the attention naturally centers on the United States and Japan, since from north to south, no other two nations occupy nearly the position that either do on the Pacific. Great Britain has announced that hereafter her oriental fleet will be much larger than she has previously maintained, Australia is planning for a navy of fair power, designed mostly for scouting and light defence work. Chile on the South American coast has a small navy with some modern ships, and had two good sized battleships under way in England when war was declared, one being taken over by the British Government and renamed the *Canada*. Submarines being built in the United States for England were given in payment for the battleships held up.

This summary of other naval power about the Pacific Ocean and the Oriental and American countries, exhausts the list for the Pacific nations, it being evident that the possible oriental fleet of Great Britain is the only one that might be of material strength. This probably will not approach the status of a full colonial navy such as Great Britain might logically keep about her possessions.

When we look at Japan in an endeavor to get a concrete idea of her naval strength, we discover that information about the Japanese Navy is scarce and hard to obtain. Japan is secretive about her naval strength, her plans and policy. Her ships are seldom seen by the public and rarely photographed for publication. Information is given out charily and only general outlines of the strength and equipment of her ships are made known.

Consequently under this veil of secrecy, it is often hard to tell just what Japan is doing and planning. Press comment in Japan is somewhat freer in this regard than it was previous to the war, and occasionally we strike items and comments that seem to point in Japan to a demand for a still greater navy. That Japan is taking note of the new alignment of fleets in the Pacific, caused by the new policies of America and Great Britain, is indicated and that these changes whereby new and greater fleets will make their home in the Pacific waters will have an effect on the development of the Japanese Navy is suggested by recent press comment in *Yamato*, a Japanese paper which speaks as follows:

"Our fleet organization will include three squadrons of eight warships. This was decided at a meeting of admirals last year and was given the imperial sanction. That is, the main body will consist of 24 ships, consisting of eight battleships which belong to the first period of the ship age (*i. e.*, within eight years after completion), eight battle cruisers and eight battleships. According to previously decided plan of organization of the Imperial Navy, our authorities expected as a first step the completion of the so-called 8:6 fleet before the 12th year of the Taisho (1923). The main body is organized with two battle cruisers which were appended at the time of the Terauchi Ministry, two battleships of the first period of the ship's age, reckoning in temporarily the *Fuso* (which should be entered in the second period of the ship's age in the 12th year of the Taisho, 1923)

and six cruisers (by including the *Haruna* and the *Kirishima* which should be put in the second period of the ship's age). Then they planned for the accomplishment of the complete 8:8 fleet which is organized of eight battleships of the first period and eight battle cruisers. However, from the standpoint of our imperial geographical condition and world position, we can hardly be expected to feel satisfied with the previously decided plan.

"Judging from the statement by Mr. Daniels, Secretary of the American Navy, which he made before the House Committee on Naval Affairs on January 4 of this year, the American Navy will be divided between the Pacific and Atlantic fleets this coming winter. It is clear that half of the American Navy will be stationed in the Pacific Ocean. As for England, according to a foreign telegram, it is reported that she has decided to send a new formation of the oriental fleet which will be larger than that of the hitherto existing fleet which has been sent to China in the past. Our empire should pay attention to these nations.

"For the sake of our imperial position, that is to certify our superior position in the Far East, to keep the perpetual peace of the Orient and furthermore, for the protection of our newly authorized dominions, as well as for the protection of our foreign trade, we must enlarge our previously decided plan and our military force. In short, under the present Imperial Navy, it is necessary for Japan to possess a fleet of three squadrons of eight warships, and it is said that our authorities have decided to report this as a plan concerning the Japanese Naval Organization. In fact the above plan is simply a positive necessity for our national defence at present. To commence its practice is another matter. It lies in the far future on account of our financial condition and the possibility of construction shops. At the 41st Diet, that adjourned March 27, 1919, the plan of three squadrons of eight ships, of Kato, Minister of the Navy, is simply the aim which our Imperial Navy should adopt in the near future. Its practice is entirely a different matter. Judging from his declaration of the difficulty of its practice, it seems impossible to enter into its practice within about ten years."

This seems to be a typical viewpoint of the Japanese press toward the naval proposition. There seems to be a general desire for expansion and further enlargement of the navy, based on the necessities of an island power and the apparent intention of Great Britain and the United States in regard to maintaining a fleet on the Pacific.

With the idea of the future of the Japanese Navy in mind, it is interesting to note its present status with regard to the United States Navy.

A first glimpse of the Japanese Navy gives the impression that it is a better balanced force than the United States Navy because of the fact that it possesses battle cruisers, a division of the navy in which the United States has been lacking for years, no vessels of even a modified type of battle cruiser being in commission. Both navies are lacking in good modern light scout cruisers, also an important feature of a well-balanced navy.

Japan has in commission five first-class dreadnoughts, four being of most recent completion, the *Settsu* completed in 1913 of 21,500 tons being the oldest of the group. The *Settsu* corresponds somewhat to the type of the *Utah* and *Florida*, mounting two more guns in the main battery however. In addition to these ships, the *Nagato*, now under construction, will no doubt be placed in commission this year according to reports from abroad that the vessel is almost completed. The *Nagato* will be a ship of 32,500 tons and will carry ten 15-inch guns. A notable fact of the dreadnoughts now in commission in Japan is that the present ships mount 12-inch guns as their largest, which gives the United States a gun advantage on the ships that correspond to Japan's most powerful rifles, since the United States dreadnoughts of the most modern type now in commission mount

twelve 14-inch guns. The *Nagato,* now nearing completion, shows an advance in armament and will mount ten 15-inch guns, as compared with the eight 16-inch guns which will be mounted by our new ship, the *Tennessee,* which in matter of completion stands at about the same point that the *Nagato* apparently does. Just the type of 15-inch guns that the Japanese have constructed is not known, but it is presumed that it may be similar to the British 15-inch gun, since the Japanese have recently, in many naval matters, adopted ideas from the British, as they did frequently in the past from the German Navy. Assuming that these guns are similar and that the Japanese have no new and startling features incorporated in their 15-inch gun, it is merely a question of theory at present, as to the comparative value of ten 15-inch guns as compared with eight 16-inch.

The battle cruisers of Japan outstrip the battleships in modernity of armament, carrying eight 14-inch guns which are made still more effective by the high speed of 27.5 knots, enabling them to outmaneuver the slower type ships and at the same time compete successfully with them in gunnery. Four battle cruisers are now possessed by Japan, and four more are projected, two of which it is believed will be laid down shortly.

The United States, as previously stated, has no battle cruisers, so that the present effect of Japan's capital ships, including both types, is the balance of nine ship in full commission against the capital ships of the United States in the Pacific Ocean, now seven in number. These represent our immediately available, effective force on the Pacific as opposed to Japan's immediately available and effective force of capital ships. The existence of the Panama Canal causes the Atlantic fleet to be a mobile reserve for use on the Pacific in case of necessity, but also is an easy means of shifting the ships, the other way in the event of a demand from the other side, which might leave the Pacific again unprotected. Japan in holding her position on the Pacific has the advantage of being an easily defended country, that may maintain a powerful, closely concentrated fleet, that as far as defensive purposes are concerned may be less costly than the fleet necessary to defend a nation with as wide-spreading shore lines as the United States.

The great mercantile fleet of Nippon is concentrated mainly on the Pacific, but is gradually spreading to other lands and new trade routes. With an 8:8 battle squadron plan, already in view, in spite of heavy naval and military burdens incurred through the Russo-Japanese war, and expenses of the war just past which are in a measure repaid by territorial gains which seem at present likely to remain with Japan, the great commercial interests of Japan naturally force constantly ambitious plans for a greater navy. A great maritime nation invariably turns to an expanded naval program, and it is safe to say that as long as the great nations maintain navies, that a power with as great commercial interests as Japan will have an incentive toward naval expansion.

As we continue our comparison of the two navies, we note that both the United States and Japan are weak in the scout cruiser class. Neither nation has in commission at present a proper number of fast light cruisers. It is notable, however, that both nations are building this type. Japan has seven first-class cruisers, one being an ex-Russian ship, and eight second-class cruisers, two being used for training purposes.

The United States has the armored cruisers which have proved valuable vessels in convoy work, but which would hardly serve to-day as modern fast cruisers, the advance screen of the battleship force. Fifteen cruisers from 7000 tons to 3500 tons of varied ages and types are also possessed by the United States, the three scouts, *Chester, Birmingham* and *Salem* being most typically scout types, though possessing only a speed of 24 knots, which is slow time for a modern type scout cruiser.

Japan is improving its light cruiser class with the construction of a number of 3500-ton types, while one or two 7000-ton ships are also reported to be on the list. The United States has contracted for ten 7100-ton scouts,

and most of these are now under way. These vessels are designed for a speed of 35 knots.

In destroyers, the United States may now be said to have an adequate number finished and under way, as the result of war-time construction, though previous to hostilities the number of first-class modern destroyers was few. Japan is less well equipped, possessing a dozen destroyers over 1000 tons displacement with a number under way, 23 being between 600 and 1000 tons displacement, and several under way; while of destroyers under 600 tons there are something over 40.

There is almost no accurate information about Japanese submarines, great secrecy being maintained about these craft. The only definite data possessed is that in the middle of 1917 there were 16 submarines in commission, and it is known that Japan was planning a number of the large seagoing type of 1000 tons submerged displacement.

The United States has about 100 coastal submarines, some of which are of little value, and at present is turning its chief attention as far as submarines are concerned to seagoing type, of which the *AA-1*, recently tried out, is a type. This is a diver of over 1000 tons with a higher submerged speed than is usual for undersea craft.

Both nations are fairly well supplied with auxiliary ships, Japan lacking mine-sweepers, and until the war the United States lacked hospital ships. There is a tendency, however, in both nations to increase the number of auxiliaries, and the United States has ammunition ships under construction and is planning for navy transports, repair ships and various other types.

Since Japan has stepped forward in importance as a naval power, by the elimination of Germany and the readjustments as the result of the war, her importance as a naval power has enjoyed a corresponding advancement. Her position as the leading commercial and business power of the east and the rapidity with which she has acquired western civilization and methods makes her assume an importance as a naval power that under ordinary circumstances a country of Japan's size would not enjoy. Out of all the eastern nations, however, she has an aggressiveness and a desire for international prominence lacking in the other Oriental nations.

Since the peace treaty and the League of Nations makes no step toward disarmament, and it seems that the powers are less ready than ever after the treachery that started the great war, to trust their neighbors and give up their fleets and armies, Japan naturally with other countries, has experienced the desire for still more adequate naval and military protection. While all nations will probably undergo a period of economy, still it is also probable, in spite of the saving that must result from the war, that there will also be a steady development of naval power to keep the fleets of the world in first-class condition.

Just as the United States is now working on a set program of naval expansion, and as this is completed will no doubt outline another plan to keep the service and equipment in the most modern fashion possible, so Japan has outlined a naval construction program that aims for a full up-to-date modern fleet with no important elements lacking. A squadron of 24 ships, none more than eight years old, by 1923 will give Japan an excellent effective navy that could meet with any navy that might probably be assembled by larger countries from more scattered areas of defence. With the nations holding more widely spread territories, there is always the important problem of when ships can be drawn from their especial sectors, and leave them unprotected for the sake of meeting an emergency at other points. While there are always correct procedures to be followed according to established rules of war, still historical examples of naval strategy have often shown that at times the principles of warfare followed in the most careful fashion have not resulted as well as might be for the navy that had the strategical problem placed before it to solve.

As the situation stands to-day, Japan has the example of England before her as another island nation that has through the centuries kept her power

and attained great strength by a steady policy of naval development. Japan is anxious as she states in press dispatches and official declarations to maintain a place of supremacy in the East. She has a fairly strong navy now in existence, and some war-time construction under way and appropriated for. Her position allows a strong consolidated fleet and her commercial interests naturally demand a certain influence and power on the seas. Every influence combined to turn Japan's attention to an expansion of her power and a continued development of her navy. That would be more natural than that Japan would fix her eyes on second place among the world navies and work toward that goal.—*The Naval Monthly,* Nov., 1919.

JAPAN PLANS LARGER NAVY.—The Japanese Government has decided upon a large increase of its navy, according to Associated Press correspondence from Tokio dated September 17. Japanese newspapers are quoted as authority for the statement that the government is to build two battle-cruisers and 22 other warships, commencing the next fiscal year, and the estimates for these ships will be submitted to the next session of the Diet for approval. The battle cruisers will be of the 40,000 ton class and their cost of construction is estimated at 120,000,000 yen (about $60,000,000). In addition there will be 3 light cruisers, 6 destroyers, 12 submarines and 3 river gunboats. The disbursement is to be spread over a period of three years from the next fiscal year. The building of two 40,000-ton battle cruisers is for the purpose of completing the "eight-and-eight" squadron which has been decided upon by Japan as necessary for the defence of the country.—*Army and Navy Journal,* Nov. 8, 1919.

JAPAN TRIES TO BUY AIR CRUISERS IN GERMANY.—Japan is said to be endeavoring to place orders in Germany for the two largest and fastest aerial war cruisers ever designed. According to reliable information, specifications have been submitted for two cruisers, to be fully armed and equipped with bombing apparatus and all the latest scientific machinery developed in Germany during the war. The type ordered is known as the Schuente-Lantz cruiser rival of the Zeppelin of similar design.

Japan, it is said, is in a great hurry for these cruisers, and in her instructions has laid emphasis upon quickness of construction. The plan is to have the cruisers shipped to Japan in parts.—*Washington Times,* Dec. 10, 1919.

EXPANSION OF THE MAIZURU ARSENAL.—Hitherto the Maizuru Navy Arsenal has only been able to build destroyers. To expand the arsenal in order to build light cruisers it is said that the expense will be included in the new budget which has been submitted by the Navy Department.—Nov. 7, 1919.

SCARCITY OF NON-COMMISSIONED OFFICERS FOR ARMY.—The great decline in the number of candidates for the military schools has given an impetus in the War Office to the consideration of various reforms in the treatment of non-commissioned officers. Now that the time is approaching for taking new recruits into the barracks, the shortage in the number of aspirants for positions as non-commissioned officers is occasioning great embarrassment. This situation is particularly marked in the cities of Osaka, Nagoya, and Tokyo. It goes without saying that non-commissioned officers play a most important part in the training of raw recruits. While the substitution of first-class privates for this work has been considered, these men have not sufficient experience to take the place of the non-commissioned officers. The War Office is proposing to submit a plan to the forthcoming Diet for increased allowances, and at the same time is considering whether it would not be possible to guarantee positions in the civil services and among private business houses to non-commissioned officers after a term of service.—Nov. 7, 1919.

THE FOREIGN MINISTER SUBMITS TO PUBLIC OPINION.—Since Viscount Uchida declared that the advisability of making the settlement in Tsingtau on international affairs was being considered, public opinion has been boiling with opposition, and has insisted upon an exclusive settlement. Of late, in the House of Peers, the Koseikai and the Doyokai have resolved to make a joint opposition, while in response to the persuasion of the Kenkyukai, the Sawakai and the Independents have shown a tendency towards a firm attitude in favor of an exclusive settlement. The Kenseikai is of the opinion that the establishment of a joint settlement will cause a loss to the prestige of the nation. This shows that the influence of those who favor an exclusive settlement is by no means negligible.

Although Viscount Uchida proposed a common settlement, it is thought that his views changed over to favoring an exclusive settlement, when he discovered that the common settlement would not absolutely ensure the possession by Japanese of administrative control therein and moreover he feared that at the next session of the Diet the cabinet would be attacked on this question by both houses with possible danger of its downfall in consequence.

The Foreign Minister who expected that it might be possible to soften American public opinion in regard to Shantung by exchanging the exclusive settlement to a common one, has come to realize the fact that the outcome of a small question like that of a settlement would have no affect on the American public opinion in its decision on a fundamental issue such as whether Shantung should be turned over to China or to Japan. Moreover he has clearly seen in view of the circumstances connected with America's defeat of the Shantung amendment that a common settlement would be purposeless and that it was no longer necessary nor diplomatic to advocate it. It seems likely that in a few days he will make a declaration in some form that although a common settlement was being considered, an exclusive settlement has been decided upon. Of course Viscount Uchida will utterly lose face as a consequence, but from the point of the eventful benefit of the nation, the execution of the reconsidered course will be far better for the prestige of the nation.—Nov. 7, 1919.

UNITED STATES

NAVAL POLICY

URGES NAVY EQUAL TO ANY BY 1925.—Unless there is some limitation placed on the size of armaments by international agreement or through the proposed League of Nations, the General Board of the navy takes the position, in its recommendations just submitted to Secretary Daniels for the naval increase program for 1921, that the "policy of the United States, upon which its building programs are formulated, should be continued."

This policy is to make the American Navy second in size and strength to none in the world, and the recommendations of the General Board for some years have been in favor of bringing the American Navy to that position of strength by 1925. Since 1915 the General Board has advocated and adhered to the naval policy that the American Navy "should be ultimately equal to the most powerful maintained by any other nation in the world," and that "it should be gradually increased to this point by such a rate of development, year by year, as may be permitted by the facilities of the country, but the limit above defined should be attained not later than 1925."

"The United States borders upon two oceans," the board stated in its recommendations to Secretary Daniels, made public to-day, "and the protection of our coasts, together with the great increase in our merchant marine renders necessary the possession of a navy by the United States large enough to protect our national interests in both oceans."

Building Program for 1921.—The building program recommended by the General Board for the fiscal year 1921, all of which can be laid down in that year, is as follows:

Two battleships, one battle cruiser, ten scout cruisers, five flotilla leaders, six submarines, two airplane carriers, one destroyer tender, one submarine tender, and $27,000,000 for aircraft construction, including experimental development.

"Since we aim to build up our merchant marine unhampered to such a limit as our national interests and resources warrant," the General Board stated in its report and recommendations to Secretary Daniels, "we must also build up our navy to a strength sufficient to support and protect our sea-borne commerce, as well as to provide for the efficient protection of our long continental coast lines and our island possessions.

"The strength necessary for our future navy will depend upon the strength of the navies of the powers in position to challenge our legitimate commercial expansion upon the high seas, and so long as no agreement limiting naval armaments exists it will be necessary for the United States to steadily add to the number and power of its naval ships for the security of our interests and also to provide replacements for ships which by reason of the rapid development in naval construction will have to be relegated to the second line or scrapped.

"The United States Navy is very deficient in scout cruisers. These vessels are highly necessary to make up a well-balanced fleet, and its successful operation would depend very greatly upon the use of such vessels. Great Britain found this type of vessel very necessary in connection with the operation of her fleet in the North Sea. Such being the case, we have far greater need for these vessels, as it is not likely that any operation in which our fleet may engage would be confined or limited to an area as small as the North Sea. The General Board urges upon the department the construction of increased numbers and improved types of these vessels.

"The flotilla leader, which is a super-destroyer, is a new type of vessel developed during the recent war. These vessels are used to lead flotillas of destroyers in action. Being larger than destroyers, they carry the essential facilities for a flotilla commander. They are better equipped for signaling and range finding, carry a heavier battery and a much more efficient radio equipment than a destroyer. They proved themselves to be very useful in the late war and are now generally recognized as being required by modern organization for destroyer operations. Also, these larger vessels were found necessary for screening battle cruisers, where ability to maintain high speed in a seaway is a necessity. The General Board recommends that the department include this type of vessel in its estimates for the building program for the fiscal year 1921."

For Big Submarines.—The board recommends building at least two submarines each of the following types:

"(a) A very long radius submarine with heavy armament and the longest practical radio sending range; surface and submerged speeds to be moderate, but with considerable submerged radius; four bow and two stern tubes, fifteen long 21-inch torpedoes, two 6-inch guns, and one anti-aircraft gun; about 300 feet in length and 2000 tons surface displacement and about 14 knots surface speed.

"(b) A long radius mine-layer, generally modeled after ex-German submarine *U-117*.

"(c) A general purpose submarine of moderate size, between 200 and 250 feet length, and corresponding surface displacements of 800 to 1000 tons; to be the best combination that we can evolve as a result of our prospective experiences with different designs of class *AA-1* and *U-111*."—*New York Times*, Dec. 10, 1919.

NAVY DEPARTMENT—BUREAU OF CONSTRUCTION AND REPAIR

VESSELS UNDER CONSTRUCTION, UNITED STATES NAVY—DEGREE OF COMPLETION, AS REPORTED NOVEMBER 30, 1919

Type, number and name	Contractor	Per cent of completion			
		Dec. 1, 1919		Nov. 1, 1919	
		Total	On ship	Total	On ship
Battleships					
43 Tennessee	New York Navy Yard	93.5	89.5	91.2	87.2
44 California	Mare Island Navy Yard	84.1	77.3	80.3	72.9
45 Colorado	New York S. B. Cpn.	37.1	20.6	34.9	18.1
46 Maryland	Newport News S. B. & D. D. Co.	58.	51.2	56.	49.3
47 Washington	New York S. B. Cpn.	36.1	19.3	34.4	17.2
48 West Virginia	Newport News S. B. & D. D. Co.	27.	3.2	26.3	2.6
49 South Dakota	New York Navy Yard	Large part of structural and special steel ordered. Patterns under way.			
50 Indiana	New York Navy Yard				
51 Montana	Mare Island Navy Yard				
52 North Carolina	Norfolk Navy Yard				
53 Iowa	Newport News S. B. & D. D. Co.				
54 Massachusetts	Beth. S. B. Cpn. (Fore River)				
Battle Cruisers					
1 Lexington	Beth. S. B. Cpn. (Fore River)	Preliminary modified plans and specifications furnished builders. Development of working plans in progress. Structural steel being ordered.			
2 Constellation	Newport News S. B. & D. D. Co.				
3 Saratoga	New York S. B. Cpn.				
4 Ranger	Newport News S. B. & D. D. Co.				
5 Constitution	Phila. Navy Yard				
6 United States	Phila. Navy Yard				
Scout Cruisers					
4	Todd D. D. & Const. Cpn.	32.2	10.8	32.	10.6
5	Todd D. D. & Const. Cpn.	30.1	9.1	29.9	8.9
6	Todd D. D. & Const. Cpn.	24.	2.	23.8	1.8
7	Beth. S. B. Cpn. (Fore River)	2.8	1.7	2.	1.2
8	Beth. S. B. Cpn. (Fore River)	2.8	1.7	2.	1.2
9	Wm. Cramp & Sons Co.	20.	....	17.	....
10	Wm. Cramp & Sons Co.	20.	....	17.	....
11	Wm. Cramp & Sons Co.	7.	....	6.	....
12	Wm. Cramp & Sons Co.	7.	....	6.	....
13	Wm. Cramp & Sons Co.	7.	....	6.	....
Miscellaneous					
Fuel Ship No. 17, Neches	Boston Navy Yard	42.7	35.1	38.9	29.1
Fuel Ship No. 18, Pecos	Boston Navy Yard	17.9	.8	17.5	.2
Gunboat No. 21, Asheville	Charleston Navy Yard	93.	90.	90.	87.
Gunboat No. 22, Asheville	Charleston Navy Yard	89.	6.9	7.7	5.7
Hospital Ship No. 1, Relief	Phila. Navy Yard	61.5	57.5	57.	52.5
Amm. Ship No. 1, Pyro	Puget Sound Navy Yard	98.5	97.	98.	96.
Amm. Ship No. 2, Nitro	Puget Sound Navy Yard	76.	62.	73.	59.
Rep. Ship No. 1, Medusa	Puget Sound Navy Yard	14.	0.	12.	0.
Destroyer Tender No. 3, Dobbin	Phila. Navy Yard	7.	3.	4.3	15.

There are 118 destroyers, 53 submarines, 3 mine-sweepers, 10 seagoing tugs, 7 harbor tugs and 7 oil tankers, in various stages of completion.

There were completed and delivered to the Navy Department during the month of November 7 destroyers, 1 submarine, 2 seagoing tugs, and 2 oil tankers. The delivery of 1 Ford Eagle completed the contract for this type of ship.

There are in addition 12 destroyers and 10 submarines authorized but not under construction or contract. Miscellaneous vessels authorized but not under construction or contract (3): 1 submarine tender No. 3, 1 destroyer tender No. 4, and 1 transport No. 2.

How LARGE A NAVY?—(Comment.)—The General Board of the navy, in submitting to Secretary Daniels its recommendation that the sea establishment should be equal by 1925 "to the most powerful maintained by any other nation of the world," has not changed its mind since 1915, when it first urged such a policy. The General Board has learned nothing from the war. Since 1915 Germany has ceased to be a great sea power. It may be said that her fleet committed suicide at Scapa Flow. Before the war the German Navy was rated the second in the world, surpassing the United States Navy. It was a matter of concern when the Germans threatened Venezuela or bullied Haiti. Hints were often thrown out that the Imperial Government had not recognized the Monroe Doctrine and would never do so. It was necessary, therefore, to maintain a powerful American fleet on the Atlantic Coast, and to be always on the alert for diplomatic friction. To-day one American super-dreadnought, the *Pennsylvania,* is more redoubtable than the remnant of the German Navy. Obviously the United States need not be nervous about Teutonic sea power.

The United States and Great Britain were preparing in 1914 to celebrate one hundred years of unbroken peace. All their differences had been settled by arbitration or by diplomatic exchanges. It was planned to set up commemorative monuments and tablets, the foundations to be laid by the President of the United States and the King of Great Britain and their representatives; on a certain day work everywhere was to be stopped for several minutes and the national anthems were to be played and sung; chairs of history were to be endowed, text-books revised in the interest of truth, and religious exercises held. The great war halted these plans. At the time the celebrations were to take place Great Britain was fighting for the integrity of Belgium, for the defence of France, and for her own existence; and the shadow of war was lengthening across the Atlantic.

Since the war Great Britain has reduced her navy—the German menace will no more be a nightmare. Great Britain is not building against the United States; in that direction she sees no cloud the size of a man's hand, and expects to dwell in amity with the Western Republic. Moreover, Great Britain has incurred a colossal war debt, and has no money to spend save for what is absolutely essential. The truth is that the size of her army for co-operation with the French land forces in emergencies is of more concern to her than the might of her navy. Obviously the United States need not be nervous about British sea power. The Atlantic Coast is as secure as if there were no fleets in Europe. No American admiral, no American public man walked the floor in concern about British aggression in 1915, when the General Board first urged a navy "second to none"; to talk about British aggression to-day would be grotesque.

The General Board says that "the protection of our coasts, together with the great increase in our merchant marine, renders necessary the possession of a navy by the United States large enough to protect our national interests in both oceans." The principle is sound, but why the necessity of continuous naval expansion up to 1925 when no sea power can have designs on either coast or thinks of tampering with the American merchant marine? Our cargo carriers may sail the Seven Seas without molestation. Our now great navy can furnish all the protection conceivably needed, with many warships to spare. It is far stronger, far more formidable than the Japanese fleet, and to keep it so is unassailable good policy.

Secretary Daniels in his report just issued says that in the twelve months ended October 1, 1919, 1 battleship, 103 destroyers, and 32 submarines were built, and that "this leaves under construction at the present time 12 battleships, 6 battle cruisers and 10 scout cruisers," exclusive of smaller craft. The General Board recommends that there be laid down in 1921 2 battleships, 1 battle cruiser, 10 scout cruisers, 5 flotilla leaders (large destroyers), and 6 submarines. If the Secretary's figures of authorized

construction are correct, a Congress dedicated to economy may well hesitate to heed the proposals of the General Board, which has never been known to cry "enough."—*New York Times*, Dec. 11, 1919.

MATÉRIEL

THE NAVAL ESTIMATES.—For the greater part, the naval estimates show a marked decrease, owing largely to the decrease in personnel, resulting in a cut in the expenses for pay and subsistence. While the army estimates were based on the needs of an army of 576,000 officers and men, which is larger than the average size provided for during the current year, the navy estimates are based on the permanent personnel of 131,485, which involves a sharp decrease in navy personnel. The greatest reductions were made in the items of pay of the navy, cut from $164,203,494 to $136,075,694; provisions for the navy drop from $42,664,500 to $27,000,000; and Maintenance, Bureau of Supplies and Accounts, from $15,500,000 to $8,500,000. The results of the visit of Secretary Daniels to the Pacific coast are reflected in requests for large appropriations for construction work at San Francisco, Puget Sound, San Diego, San Pedro and Pearl Harbor, Hawaii. The largest of these items is $10,000,000 for the establishment of a docking and repair plant for capital ships on San Francisco Bay.

Under the heading, Increase of the Navy, the following sums are included in the book of estimates: Construction and machinery, $105,000,000; torpedo-boats, $23,748,000; armor and armament, $49,000,000; ammunition, $7,500,000. The total appropriation asked for the marine corps is $31,750,813.28, as against $42,749,888.28 this year.—*Army and Navy Journal*, Dec. 6, 1919.

LAUNCH OF U. S. S. "CALIFORNIA."—When the U. S. battleship *California* was launched at Mare Island, California, on November 20, 1919, the brakes to slacken her momentum as she slid into the water failed to hold sufficiently, and she smashed into a pier, but no one was injured, and the damage was slight The vessel was christened by Mrs. Randolph T. Zane, daughter of Governor Stephens, of California, and widow of Major R. T. Zane, U. S. M. C., who was killed in France. The keel of the *California* was laid October 16, 1916. She has a length over all of 624 feet, a breadth of 96 feet and a depth of 47.2 feet. Her displacement at her mean draft of 30.5 feet would be 32,000 tons. She will have an estimated speed of 21 knots and a normal fuel capacity of 1900 tons. Her main battery will consist of twelve 14-inch guns.—*Army and Navy Journal*, Nov. 29, 1919.

NAVY CONTRACTS FOR 10 BOMBING PLANES.—The navy has contracted for 10 Martin bombing planes, each equipped with two Liberty motors. Ensign George H. McCarthy has been ordered to inspection duty at the factory of the Glenn L. Martin Co., which is building the planes. These planes will have folding wings and will operate with the fleet.—*Army and Navy Journal*, Nov. 29, 1919.

PERSONNEL

BOYS ENTERING NAVY MUST BE 18.—Having found that about eight per cent of the first enlistments for the U. S. Navy during the recruiting drive of the last few months was composed of boys under required standard of age and physical condition, some of them being 17 years old and under, the Bureau of Navigation has sent out instructions to recruiting officers that until further notice the minimum age for enlistments will be 18 years. Exception will be made only in specified instances where recruiting officers have promised applicants enlistment in the navy on reaching the age of 17 years and having the consent of their parents or guardians. It has been ordered that no further promises of this nature be made and that every

care be exercised against enlistments below 18 years.—*Army and Navy Journal*, Nov. 22, 1919.

AMERICAN NAVAL PAY.—In common with our own (British) service, the American Navy has been hard hit by the increased cost of living, and the recent proposals to increase the pay of officers by 30 per cent and of the men by 50 per cent are extremely modest, so much so that it is surprising that such evidence as that given before the House Naval Affairs Committee recently by leading officers should be necessary. Admiral H. B. Wilson, who commands the Atlantic fleet, made a startling admission which showed how acute the personnel problem had become in his command. He said there were barely enough skilled men to keep the navy anywhere near standard, and instanced the battleship *North Dakota* as "the only ship in the Atlantic fleet able to move." He stated that he would do all he could to keep those in the navy contented, because "contented men deliver the goods all the time"; and in regard to himself, he said that he got £2000 a year, but compared with similar responsibilty in the industrial world such compensation was small, for he was not allowed to have "sidelines or investments," and therefore he felt he was not lavishly reimbursed for his work. "I feel that I have given back to the government," said the admiral, "many times the investment it has in me." It is well to have this aspect of the question candidly put by so high an authority as Admiral Wilson. Good pay to the right man in naval service is a fine investment, whether the man remains in the service or returns to industry. As Rear Admiral Washington said in giving evidence in regard to petty officers, the American Navy took men and trained them, and then they went to the Shipping Board or transport service, where they could command higher rates of pay. The navy, in fact, is a great training institution for industry as well as an organization for defence, which is to the national advantage, but the primary function of the fleet must not be lost sight of, and this cannot be achieved with an underpaid personnel.—*The Army and Navy Gazette*, Nov. 15, 1919.

U. S. NAVAL RESERVE FORCE POLICY.—Following the recommendation of the Naval Reserve Force Conference held in Washington on September 22 and 23, the general policy of the organization has been laid down on lines suggested by the Bureau of Navigation, Navy Department. The Reserve Force will be organized in each naval district. There will be an officer in the district commandant's headquarters directly charged with Reserve personnel whose duty will be organizing the Reserves, arranging for their instruction and training, and keeping the records of officers and men up to date. The Bureau of Navigation has also determined that the records of the officers and men shall be kept in the districts in which they reside rather than in the district in which they enrolled. Orders to this effect have already been promulgated. Reserve personnel will be organized and assigned to various units within the district for the purpose of mobilization, training and drill in sections, divisions, battalions and brigades, depending upon the number of men in the geographical location. Divisions will be organized at the smaller centers, the size depending upon the number of men available. Battalions will be formed at all important geographical locations where there is sufficient personnel. The battalions and divisions in any district will comprise the brigades, whch will be numbered according to the district. It has been ruled that all personnel in the district will be attached to some unit.

According to the present law, approved July 11, 1919, no member of the Naval Reserve Force shall be recalled to active duty for training or for other duties except as specifically provided in the bill. In spite of this fact, however, the Bureau of Navigation is advised that many of the Reserve are anxious to become identified with the particular unit in their locality

and will report voluntarily for instruction. Commandants are instructed to consult with senior Naval Reserve officers of their district as to means to properly effect organization for instruction and mobilization purposes. Instructions will be issued by the bureau from time to time relative to organizing and training the Reserves. With the purpose of making the Reserve Force as effective as possible the Bureau of Navigation has asked for suggestions from commandants relative to these questions of organization and training.—*Army and Navy Journal,* Nov. 29, 1919.

ATLANTIC FLEET PREPARING FOR SEA.—The overhaul and repair work on the vessels of the Atlantic fleet, which have been fitting out for sea at various navy yards, is so well advanced as to make certain the sailing of the fleet for southern waters on January 8. Admiral H. B. Wilson, the Commander-in-Chief of the fleet, will have under his command two divisions of battleships, 54 destroyers, submarines and auxiliaries. While there will not be a sufficient number of men or men in the proper ratings to fully man all craft, the ships' officers will necessarily have to make the best of the situation, which it is believed will improve rapidly. A steady increase in enlisted personnel, it is hoped, will show the fleet nearly up to normal by spring. Fleet officers are optimistic and are rather anxious to try out an experiment new to many of them, in demonstrating how well a ship can be kept up to requirements with a greatly decreased crew.—*Army and Navy Journal,* Nov. 29, 1919.

MERCHANT MARINE

WORLD'S TONNAGE FAR LESS EFFICIENT.—P. A. S. Franklin, President of the International Mercantile Marine, made the following interesting statement at a recent hearing of the House Committee on Merchant Marine:

"The tonnage of the world is about the same as in 1914, but a great deal of it is less efficient tonnage than existed at that time. The conditions the world over in transportation are such that I doubt if this tonnage is being used to, say, within 40 or 50 per cent—or to put it the other way—I doubt if we are getting more than 60 per cent on pre-war efficiency out of our tonnage.

"The delays in port, the delays in making repairs, the congestion of traffic at the ports abroad that are open, and the shortage of hours of labor are all causing delays and reducing the efficiency of tonnage. I don't think that you should feel in your mind that this is going to be a continuing factor to the extent of the percentage named above.—*The Nautical Gazette,* Nov. 22, 1919.

FREE PORT IDEA DECLARED UNCONSTITUTIONAL.—Apparently the free port idea has received its quietus pending a change in the United States constitution. Chairman Fordney, of the Ways and Means Committee of the House, has stated that the proposition is viewed by a number of members of the committee as unconstitutional.

Mr. Fordney bases his decision as to the unconstitutionality of the bill on Section 9 of the constitution, which provides that "no preference shall be given by any regulation of commerce or revenue to the ports of one state over those of another; nor shall vessels bound to or from one state be obliged to enter, clear, or pay duties in another."—*The Nautical Gazette,* Oct. 25, 1919.

"IMPERATOR" NOW BRITISH.—The former German passenger steamer *Imperator* has at last been turned over to the British, and the crew of some 500 men which has been waiting in this port to take the vessel to England will now soon take the big vessel away. The *Imperator,* according to the agreement made by the Council at Paris, with nine other German vessels,

including the *Zeppelin, Pretoria, Patricia, Graf Waldersee,* were to be used first to help bring home American soldiers and then given to the British. When the time came to turn these vessels over, for some reason, not yet announced, the Shipping Board held on to them. Even now the *Imperator* is the only one delivered.

At such a time as this when ships are needed, it seems to have been an unnecessary delay and the cause of a very serious loss, particularly to the Cunard Line, which is to operate the big steamer between this port and Southampton. This loss is estimated at half a million dollars. The vessel when operating is worth $8000 a day. Captain Smith and a crew of 500 seamen and engineers have been waiting here for two months. The cost of these men is put at $3000 a day at least.—*The Rudder,* December, 1919.

GOVERNMENT TO SELL WOODEN SHIPS.—The government proposes to sell all of its wooden ship hulls that remain in the war-time ship yards. There are nearly 200 brand new wooden ships on both seaboards upon which the government has set the price of $75,000 for the Ferris 3500-ton hull, of which there are more than any other type to be disposed of, while the comparatively few remaining types will be sold at prices agreeing proportionately. The details of the newly adopted sales plan were made public in a statement from G. H. S. Rollason, manager of the supply and sales division of the United States Shipping Board, Emergency Fleet Corporation.—*Shipping,* Nov. 19, 1919.

A BALANCED MERCHANT FLEET.—The question of "balance" is one that applies throughout all of our living and business surroundings. This affects our relations with each other in a business and personal way. It has reference to railroads, steamship lines, fleets of steamships and any combination that is working as a unit. If our army had not been well balanced during the recent war it would not have been able to function as well as it did and if certain elements had been lacking it might not have been able to fnriction at all. One of the main considerations always in the minds of naval constructors when planning vessels for the navy is to so arrange their building program that they will have vessels for fighting, for scout duty, for supplies and all the other necessary branches of the service. The question of a "balanced" fleet is now before the maritime interests of the United States and is one which will require very careful consideration and planning.

Due to war conditions is was necessary to develop quickly something that could carry stores and men. On the advice of naval architects it was deemed advisable to create a fleet which could be constructed quickly and put to work without delay. Following out this program, there have been many merchant vessels built of between 7500 and 9000 deadweight tons. These must now be balanced by vessels of larger size and tonnage.

The plan of the United States Shipping Board to build vessels of about 13,000 tons was recently abandoned—there being a feeling in shipping circles that this type of ship should be developed by private interests according to their needs.

To those of the shipbuilding world who have been looking forward to the building of two 1000-foot liners planned by the United States Shipping Board for passenger service, this decision will be a disappointment, for it has been hoped by many that construction of these vessels would be begun at an early date. Because of the long distance voyages necessary for American ships, larger vessels are far more economical in operation than the type which has been built under war requirements. It is therefore to be hoped that the near future will see a program developed by private interests that will help out our shipyards, by placing orders with them for vessels of the larger and liner types.—*Shipping,* Nov. 19, 1919.

NAVIGATION AND RADIO

MEASURING OCEAN DEPTHS BY ECHOES.—That soundings should be taken by sound seems quite appropriate, and newspaper paragraphers are invited to take notice. The marimeter, a device described in the *Pacific Marine Review* (San Francisco, October), sends a sound to the ocean's bottom whence it is reflected and returns as an echo, the machine meanwhile recording the precise time of travel. From this the depth is easily calculated from the speed of a sound-wave in salt water. With the marimeter four soundings may be taken per minute, whereas the old methods require 10 to 20 minutes for each operation. The manufacturers assert that it is the greatest safeguard to shipping ever invented, with the single exception of wireless telegraphy. The marimeter was invented by Samuel Spitz of Oakland, Cal. The practical development and its application to marine soundings have been under the direction of John Eldridge. The first installation is now being made on the Pacific Steamship Company's steamer *Governor,* while the vessel is in dry dock in Seattle. Says the writer:

"The principle upon which this ingenious device works is electricity controlled by sound vibration. A sound wave is sent out from the bottom of the vessel mechanically and the instant this sound is started it is picked up electrically and relayed to the recording instrument and the dial of the recording instrument begins to register. The sound wave travels to the bottom of the ocean and returns in the form of an echo, and this echo is also picked up by the diaphragm in the bottom of the boat and is also relayed by electricity to the recording instrument, causing the pointer to immediately stop. The depth will be shown in fathoms, and four soundings may be made per minute, all directly under the ship's keel.

"Sound travels at practically a uniform rate in the water (about 4000 feet a second). The depth is measured by accurately taking and recording mechanically the time for sound to travel down and back. This will show the actual depth under the keel of the boat."—*The Literary Digest,* Nov. 29, 1919.

WIRELESS IN TRANSPORTATION.—Among the many advances in modern engineering practice which tend to lighten and make more safe the work of shipping men, wireless telegraphy stands in the front rank. It is needless to recall the recent occasions when this friend of the shipping man has been able to bring relief after disaster and many times to avert trouble.

At one time the wireless was looked upon more as an experiment which might be of interest, but was not considered as a practical everyday asset to the business world. Thanks, therefore, are due to the members of various engineering societies who have been tireless in research and experimentation for bringing it to its present high state of perfection.

The possibilities of this system of communication were appreciated by the Germans who had all of their colonies linked up with central office in Berlin. On the other hand the Allied Governments were not backward in invoking the services of wireless in the handling of large bodies of troops ashore as well as afloat.

With the war as a thing of the past, attention is now turned to the extension of wireless telegraphy to the requirements of peace. In no one line can this be of more service than that of transportation, where the need exists of constant communication between moving bodies and their headquarters or between each other, such as vessels at sea or freight and passenger trains on railroads. The shipping master can always be in touch with his home office and to the ship operator who is able to remain seated at his desk and direct the voyages of his ships while many thousand miles distant, the use of the wireless proves to be one of the blessings of the twentieth century.

The recent development of the wireless telephone and underwater communication by sound are making the navigating of ships while entering

ports a much easier proposition for the pilot and captain than in the old days when approach of land was a matter of anxiety to both. The constant effort which is being made by many of the engineering societies and business organizations to produce instruments which will improve this communication is noticeable from time to time through the medium of reports given at their different meetings and otherwise, and although much of the ultimate outcome is still in the realm of research, the time will soon come when our business and shipping interests will reap the benefit of developments now being setadily and surely matured.—*Shipping*, Nov. 19, 1919.

REMARKABLE AMPLIFICATION.—The British Navy is credited with having carried out a series of remarkable wireless tests during the war, in the form of ultra-amplification. In order to hear, if possible, what the German ships were saying among themselves, the Britons set to work on multi-step amplifiers for their naval bases. The result was a 19-step amplifier of the vacuum tube type, which magnified intercepted buzzer signals many million times. The British plainly heard the German buzzers working between ships, by the use of these amplifiers.—*Scientific American*, Nov. 8, 1919.

RADIO BARRAGE RECEIVERS.—Dr. Alexanderson, the well known wireless engineer, has developed what he calls a barrage receiver, which permits receiving stations to turn a deaf ear to all other messages except the particular one which they desire to hear. In a recent lecture Dr. Alexanderson outlined a comprehensive plan for a world-wide system of radio communication, which, he believes, will send messages at the rate of 100 words per minute.—*Scientific American*, Nov. 29, 1919.

CHANGE IN THE "AMERICAN EPHEMERIS AND NAUTICAL ALMANAC."—Authority has been granted for the introduction into the *American Ephemeris and Nautical Almanac*, beginning with the year 1925, of the Civil Day, beginning at midnight instead of the Astronomical Day beginning at noon.

ENGINEERING

THE ELECTRIC PROPELLING MACHINERY OF U. S. BATTLESHIP "TENNESSEE."—When the United States battleship *Tennessee* was launched a few months ago from the Brooklyn Navy Yard one of the most formidable machines of its kind in existence was set in motion. The speed of the *Tennessee* will permit her to equal any vessel of her class. In addition, it is stated that she will be able to shoot harder and stand more punishment than any other vessel afloat.

Her overall length is 624 feet, beam 97 feet, draft 31 feet, and full load displacement 33,000 tons. She will mount twelve 14-inch guns of 50 caliber, twenty-two 5-inch guns of 51 caliber, two 3-inch anti-aircraft guns, four saluting pieces, and two 21-inch submerged torpedo tubes. Her armor protection, which is said to be as complete as naval science can make it, will consist of 14-inch plate at the belt, 8-inch aft, and 3-inch at the deck ends, with special protection against torpedo attack. Her complement will be 1119 officers and men.

She will be propelled by electricity and each of her four propellers will be driven by its own motor supplied by two turbine-driven generators. The maximum power of the vessel will be 33,500 horsepower and her maximum speed over 21 knots.

The Navy Department has experimented with electric drive for several years and has decided to use it on the new battleships because its use permits greater freedom in the design of the ship.

With geared turbines there is little leeway in the location of the engine room. With electric drive, on the other hand, the turbines and propellers are entirely separate mechanically, the former can therefore be placed in

almost any desired location. This flexibility is of special importance in battleship construction because it permits greater consideration to be given to purely naval factors, such as the arrangement of magazines and the protection of vital parts. In fact, owing to the freedom of locating bulkheads, it is possible to make an electrically operated battleship practically torpedo proof. The motors can be placed well aft, so that the length of the propeller shafts can be reduced to a minimum, and the turbines can be so located with reference to the boilers and condensers that live steam, oil, exhaust steam and other important pipe lines can be made as straight and short as possible.

The Turbines.—The turbines of the *Tennessee* are of the Westinghouse single-cylinder, semi-double flow, impulse-reaction type. The high pressure steam first passes through a two-row impulse wheel in each turbine and then through a section blading. It then divides into two equal parts, each part passing through a low-pressure reaction section into the condensers.

The speed of the turbines can be varied through a range of from 1500 to 2270 r. p m., by means of manually-controlled hydraulically operated governors. The movement of a control handle varies the pressure in an oil system and this in turn varies the loading of the governor and causes a change in speed. With this system there are no rods or shafts to jam where they pass through the bulkheads. A unique feature is that the oil pressure is caused to pulsate thus keeping the entire mechanism slightly in motion. This prevents sticking of the parts and adds greatly to the sensitiveness of the control which is of great importance when ships are steaming in formation.

The speed of the turbines, as determined by the setting of the governor, remains practically constant regardless of the load and hence the propellers do not race when they leave the water in rough weather. Automatic stops are also provided, which cut off the steam in case the speed of the turbines becomes abnormal.

The Generators.—The generators, which are directly connected to the turbines, are two-pole Westinghouse machines and supply the motors with 3-phase, 3400-volt alternating current at frequencies ranging from 25 to 38 cycles, depending on the turbine speed. They are excited from the direct-current power supply of the ship and each can develop 15,000 k. v. a. at the maximum speed of the turbine. The generator coils are carefully insulated so as to prevent injury from high temperature, moisture, and accumulations of salt. They are kept cool by air which is forced through the ventilating ducts by fans mounted on the rotor shafts.

The Motors.—The four motors of Westinghouse induction type are direct-connected to the propellers and each can develop a maximum speed of 8375 horsepower continuously. To provide a sufficiently wide speed range, each has two windings, one of 24 poles and the other of 36 poles. The same result could have been obtained by the use of a single winding but this would have involved greater complication in the connections and would have restricted the design in other ways. The 24-pole winding is connected to slip-rings on the rotor shaft while the 36-pole winding has short-circuiting connections and is equivalent to a squirrel-cage arrangement. Both windings are used for running but only the 24-pole for starting and reversing, resistance being inserted in series with it during these operations. The insulation of the motor is similar to that of the generators and ventilation is provided by means of two motor-driven fans mounted on the top of each motor.

Speed Control.—The method of controlling the speed of the motors can be readily understood by considering that the 36-pole winding is equivalent to a gear of an 18 to 1 ratio between the turbines and the propeller, while the 24-pole winding is equivalent to a gear of a 12 to 1 ratio. Hence when the 36-pole winding is used, the motor-speed will vary from 83 to 126 r. p. m. when the turbine speed is varied through its range of 1500 to

2270 r. p. m. and with the 24-pole winding the motor speed ranges from 126 to 186 r. p. m. To control the speed of the ship three different combinations are employed:

1. From 9 to 15 knots. The motors are operated on the 36-pole windings and all four are driven by one turbo-generator.
2. From 15 to 17 knots. The motors are operated on the 24-pole windings by means of one turbo-generator.
3. From 17 to 21 knots. The motors are operated on the 24-pole windings by means of both turbo-generators.

To reverse, two phases at each motor are transposed without changing the direction of rotation of the turbo-generators.

Steam Consumption.—The use of one turbo-generator for the lower speeds assists in maintaining good operating economy by keeping the load on the unit close to its rated capacity, except at the very slowest speeds. The steam consumption per shaft horsepower-hour, including that required for excitation, condenser operation, and motor ventilation, is as follows:

Speed Knots	Motor Poles	No. Turbo Units	Lbs. of Steam
9	36	1	16
15	36	1	12
15	24	1	13
17	24	1	13
17	24	2	12.4
19½	24	2	11.7
21	24	2	11.9

—*Shipping*, Nov. 19, 1919.

WAR PRODUCTION OF INTERNAL-COMBUSTION ENGINES.—Some interesting figures relating to the production of internal-combustion engines by British manufacturers during the war are given in Dr. T. Blackwood Murray's presidential address to the Institution of Engineers and Shipbuilders in Scotland, which was read on the 18th inst. From figures supplied by the Ministry of Munitions, and quoted by Dr. Murray, it appears that the total horsepower of aero engines manufactured between August, 1914, and the end of 1918 amounted to no less than 7,094,000, and more than half of the total, viz., 4,143,000 horsepower, was turned out in the last year of the war. Between August, 1914, and December of that year, the output was only 12,000 horsepower, and for 1915, 1916 and 1917, the outputs were 195,000 horsepower, 771,000 horsepower and 1,973,000 horsepower respectively. The data relating to engines for mechanical transport purposes are not so complete, as they are only given from September, 1916. For the four months of that year the output amounted to 137,000 horsepower, and the figures for 1917 and 1918 are, respectively, 683,000 horsepower and 662,000 horsepower. The production of these engines for the war period prior to September, 1916, probably amounted to about 750,000 horsepower, so that the aggregate production for the whole of the war would be 2,232,000 horsepower. The manufacture of "tank" engines was commenced in 1916, in which year the production totalled 16,000 horsepower, while in the two following years the production was 133,000 horsepower and 191,000 horsepower respectively. The total production of tank engines thus amounts to 340,000 horsepower. From these figures it appears that what may be called small internal-combustion engines aggregating nearly 10,000,000 horsepower were made during the war for the three uses mentioned above, and as many more must have been employed for lighting and pumping sets, and other work, the complete total was considerably greater. It may be interesting to add that at the conclusion of hostilities 62,000 motor lorries, 28,000 motor cars, and 33,000 motor cycles were in the possession of the British War Department.—*Engineering*, Nov. 21, 1919.

ENGINEERING EXPERIENCE.—In engineering as in other professions, the value of a man's services is measured by his experience and his ability to make application of his technical knowledge and experience. The more varied an engineer's experience is, the more valuable he will be to any organization, provided of course that he has the ability to profit by the comparison in doing things which have been a part of his practical training. To do things blindly profits no one; it is the careful study as too the "whys" and "wherefores" of doing certain things that make the broad gaged and discerning engineers—fellows who can quickly analyze a problem from an engineering standpoint as to both economy and proper design. The engineer who pays no attention to what his associates are doing soon becomes a "Rip Van Winkle" in so far as progress is concerned, and nowadays may become a radical, preaching far and wide the hard lot of the engineers as regards compensation and status. Can he truly expect that someone will push him ahead if he is content to go on without trying to help himself? Most assuredly not.

The idea seems all too prevalent among engineering graduates that once out of school, their study days are over. Nothing could be further from the truth, for from the nature of things it is only possible for a college course to be such as will give a man a good grounding in the principles of engineering and their application. The height to which he ascends the ladder of success depends entirely on whether he continues the theoretical and practical study of engineering and business after leaving college.

Naturally after completing a difficult course of study covering a period of four years, the desire to slight study has a real basis, and a short rest from such work will not be at all detrimental. There is danger, however, of getting out of the mood of study and research, into which many find it hard to re-enter. The average graduate, after obtaining a position, is likely to believe that practical engineering will afford him all the experience and knowledge necessary to insure his advance in the professional work. As a result, instead of spending some of his spare time reading good technical magazines and reference books, and thereby increasing his knowledge regarding methods pursued in other lines of work than the particular one he may be following at that time, he will most likely enjoy social and club life, to the utter neglect of his technical work. By this we do not mean that the social side should be neglected altogether, for it forms a very important part in any man's life if not carried to extremes.

Almost any position which the young graduate can fill must of necessity after a short time become a sort of routine, and unless the man pushes himself forward and seizes every opportunity to advance his standing, his experience will be limited and his worth will be measured accordingly.

For example: We have in mind two men working in the same office at practically the same kind of work; one quits on the dot at closing time and is out of the door before the others have thought of quitting for the day, and from that minute on until the next morning his work is entirely forgotten. The other man is generally so interested in his work that he is the last to leave, and when he reaches home he studies up on matters with which he is not familiar, not being satisfied with routine work only. There can, of course, be no doubt as to which man is the more valuable to his employer. As to the experience, it is safe to say that the latter has in the same time accumulated twice as much experience as the former, since this valuable asset is not so much an element of time alone as it is of proper use of time.

Of course we do not mean that the man should spend all his time in study. This is by all means to be avoided. Recreation and exercise are needed at all times to keep in a healthy condition, which is the first essential of a real success. Then also a study and thorough knowledge of business principles and practice psychology, and affairs of the day is

necessary if one is to meet men of other professions on an even footing and have the broad viewpoint of things so essential to success.

The man who does not trouble himself about things until the occasion arises will generally spend a day or two of his employer's time studying up on a problem which is suddenly thrust upon him; while if he had previously improved his time he would no doubt have been able to handle the problem readily, much to his own credit and to the benefit of his employer. The fellow who is not satisfied to trudge along in the same old rut and who keeps himself informed on current practice in all lines related to his own is the more experienced, and when a difficult problem arises he, rather than the plodder, will be looked upon as the man capable of handling it. His experience is therefore increased still more.

Perhaps one of the most effective means of broadening and developing the technical mind is the writing of technical descriptions of engineering works. To be able to write well, one must have a good vocabulary and the ability to pick out and emphasize such points as will interest the reader. To do this requires an intimate knowledge of the subject in hand such as can be gained only by careful study of plans, photographs and data, or of the particular structure itself. The experience gained in technical writing is sometimes more valuable than that gained from daily work.

One may ask, "How is one to know what will interest the reader?" In answer to this we would say: Take a technical article on a subject with which you are entirely familiar and note the features emphasized; also note those points on which you desire information and which have not been touched upon. In some articles you will find many such points. Then when writing an article, put yourself in the place of the reader and write so that one unfamiliar with the subject will be given a good idea of those important details which are so often omitted in technical articles because they seem to the writer to be mere matter of fact details, too common to be of interest.

Engineering experience in any line can be gained in three ways: By intimate connection with the design and construction of the work in question, by reading, and by writing technical articles on engineering works. The man with knowledge gained from all of these three sources is without doubt better than the man who has only the actual working experience, for he receives benefit from his own work and from the work of others. No engineering firm can boast of such vast experience as not to be able to learn something from another. The case of the individual is the same.—*Engineering World,* Dec. 1, 1919.

THE GAS TURBINE.—In reviewing the development of the internal-combustion engine in a paper read before the Institute of Marine Engineers, Mr. Charles Baxter touched on the problem of the gas turbine.

He remarked that the design of the internal-combustion engine as it exists to-day does not seem likely to be radically changed, since the principles are now well understood. Supercharging, *i. e.,* forcing in an extra quantity of mixture or air at the end of the induction stroke has been accomplished with a little success, but nothing very revolutionary has happened, the engine becoming complicated by the addition of such items as pump cylinders. From time to time suggestions have been made that a great advance in thermal efficiency might be obtained by combining the steam and the internal-combustion engine. This idea occurred to the author several years ago, and he got out a simple design, which, however, eventually assumed such a complicated form that the idea was given up for the time being. Judging by test results, the engine of this form evolved by Mr. Still is likely to justify much of the confidence reposed in it.

The construction of a successful gas turbine is regarded as the next and final step in the development of devices for internal combustion. The great heat generated is the principal obstacle. One suggested arrangement

consists of a chamber of refractory material in which combustion of the fuel takes place, the gases impinging upon buckets on a wheel, Pelton or de Laval style. In another, of a pulsating type, the action is that the chamber being charged and fired the gas rushes out of the jet, overrunning itself by inertia and drawing another charge of mixture after it through the flap valve. This action is rapidly repeated and is analogous to that which takes place in a gas burner turned very low.

The heat generated in these devices is, of course, very great, and the combustion is so continuous that no chance is given for cooling. In the ordinary type of high-speed engine the explosions, though very rapid, are intermittent, so that the combustion chamber walls can be kept at a reasonable temperature, the incoming cool gas being of great use in this direction. In a turbine design evolved by the author some years ago, the gas was exploded in a chamber forming part of the casing. The resulting explosion did work by impinging on a chamber in the rotor, from which it escaped, being returned to the rotor vanes by means of a jet. The following charge under pressure scavenged and refilled the chamber. Such difficulties as holding the ported rings up to the rotor with just the correct pressure were surmounted by balancing the explosion pressure by means of a piston and fulcrum, the proportions being such that the pressure tending to force the ring from the rotor face was exactly balanced by the pressure upon the piston. These arrangements involved the use of turbo-compressors, the efficiencies of which are at present low, and even if a compressor of reasonable efficiency were forthcoming, there is no direct prospect of high combined efficiencies being obtainable. A combined gas and steam turbine, however, may do much to solve the problem, and the resulting machine, even if its efficiency was not such as to render existing prime movers obsolete, would undoubtedly be of some utility.—*Engineering and Industrial Management*, Oct. 23, 1919.

FILTERED GASOLINE PREFERABLE.—The modern motor and improved carburetors have demonstrated beyond question their efficiency to anyone handling gasoline successfully and also the lower grades of motor fuel. It is impossible to build a motor or to make a carburetor that will operate on water. For this reason it is important that the lower grades of fuel, as well as the highest gasoline, be free from water or other impurities. It is a difficult problem to keep moisture from gasoline, as it seems to absorb dampness from the air that effects a condensation which results in little beads of water that finally settle at the bottom. Should a drop of this water reach the carburetor it will hang on the needle valve and stop the passage of gas. The result is a spinning, sputtering motor that is likely to go dead, causing one to wonder why.

The only safe way to avoid this annoyance is to be sure the gasoline is filtered before it enters the car.—*Engineering World*, Dec. 1, 1919.

COAL GAS AS AUTOMOBILE FUEL.—In the course of the world war many motor vehicles were operated in England with coal gas, because of the scarcity of gasoline. The gas was contained in collapsible bags made of rubberized balloon fabric. At present, however, compressed gas in steel cylinders is being tried. It is stated that the gas is forced into pressures as high as 2250 pounds per square inch. The cost of compression is stated to vary between 40 and 75 cents per 1000 cubic feet of free gas, and the cost as fuel in the engine is equivalent to a cost of 12 cents per gallon on the liquid fuel replaced.—*Scientific American*, Nov. 22, 1919.

THERMIT WELDING FOR MARINE REPAIRS OFFICIALLY APPROVED.—An important development of thermit welding in American shipyards is anticipated by the recent approval by the American Bureau of Shipping of the thermit process for welding stern frames, rudder frames, and other heavy

sections on ships registered under their classification. The only qualification is that this bureau be notified sufficiently in advance to have a surveyor in attendance during the welding operation as well as to inspect and test the weld when completed.

No Thermit Failures to Date.—While the thermit process has been used since 1903 for making marine repairs and has a great many successful welds of this nature to its credit, the process was never officially approved by the American Bureau of Shipping, and most of the repairs were made on vessels not classed by them. It is due entirely to the unbroken record of successful marine welds that the bureau now accords its official sanction to the process. According to a statement by the Metal & Thermit Corporation, there has never been a single failure of a thermit marine weld so far as it has been able to ascertain in all the years that the process has been used under this company's jurisdiction.

Now that the United States promises to have one of the largest mercantile marines in the world, and as practically all of the ships which have recently been constructed, and which will be constructed in the future, will be registered with the American Bureau of Shipping, the recognition of the thermit process by that bureau bids fair to result in many important thermit marine welds from now on.—*The Nautical Gazette,* Oct. 11, 1919.

A NEW HIGH-SPEED STEEL.—A new high-speed steel known as chrobaltic alloy, which can be cast into intricate shapes, is mentioned in the *Iron Age* as being used as a substitute for tungsten and vanadium steel by a Chicago company in the manufacture of milling cutters and other tools having multiple cutting edges. The castings have the appearance of smooth forgings and are said to be practically non-rusting and acid-resisting, and the heat-resisting qualities of the alloy are such that it does not scale in the fire, thus adapting it to milling cutters having thin edges. The steel may be hardened in oil or air, and it is explained that the processes of annealing and rehardening may be repeated without the steel losing any of its properties. Annealing is effected at 1832 degrees F. in a closed muffle. Cooling is allowed to proceed slowly.—*The Engineer,* Nov. 7, 1919.

WORN INLET VALVE GUIDES.—A good deal of the irregularity of running on closed throttle and want of flexibility of the automobile or truck engine can be accounted for if the guides of the inlet valves are worn, especially if some are worn more than others. The valve stems should be a good fit in their guides, yet have sufficient freedom to reciprocate easily. If they fit loosely and differently, the amount of air drawn up around them on the suction stroke of the piston will have the effect of interfering, more or less seriously, with the operation, as the mixture drawn into the cylinder will not be the gas determined by the carburetor, but one more or less and always variably thinned out by the air drawn into these leakages. Valve stems and guides should, therefore, be a good working fit and all alike.—*Scientific American,* Nov. 22, 1919.

CHANGES IN THE FORMS OF SULPHUR IN COAL.—When coal is allowed to remain exposed to the air for any length of time, certain fundamental changes take place, the exact nature of which has been only partially determined. Since these changes affect the heating and coking value of the coal to a great extent, numerous investigations have been made in order to learn the conditions which will prevent the occurrence of these changes.

Parr and Hamilton have reviewed some of the work done on this problem, and from their own observations have come to the following conclusions:

1. Submerged coal loses no heat value.
2. Outdoor exposure causes loss of heat value from 2 to 10 per cent.

3. High sulphur coals oxidize in the open more than under cover, since the oxidation of the sulphur promotes other disintegration.

4. The main loss occurs in the first five months after mining.

Even when coal samples were sealed tightly to eliminate all air, considerable deterioration occurred. Parr and Wheeler have shown that the heating value of coal kept under these conditions may decrease as much as 4.3 per cent. Gases seem to be given off continually, but with the greatest volume during the first two or three weeks of storage. Oxidation also occurs, due probably to the absorption of some oxygen.—*Bulletin No. 111, University of Illinois,* Apr. 21, 1919.

ALCOHOL STILL KING.—King Alcohol has not been dethroned by prohibition. He has only moved his throne over into an adjoining building, and will reign over industry instead of the club and the cabaret. Instead of putting a stop to the use of alcohol, prohibition will eventually increase it about tenfold, according to facts brought out at a recent convention of chemists. It will all have to be made undrinkable by denaturing it in some of the 40 ways now approved by the government. As gasoline gets higher, alcohol will be more and more used as a motor fuel; for compounds of it are even now sold at a price but little higher than that of the familiar petroleum product. Alcohol yields more power to the gallon than gasoline, it is claimed; and it does not clog carburetors. Some of the present demand is for "solidified" alcohol, which is simply alcohol to which paraffin or some such substitute has been added. Says a contributor to *The Paper and Pulp Magazine of Canada* (Ste. Anne de Bellevue, Que.):

"King Alcohol was hailed as a new monarch of the realm of power in a symposium held at Rumford Hall, by the New York Section of the American Chemical Society. The five well-known chemists who addressed the Section told of more new sources of alcohol which could be tapped and indicated many new uses for it. The facts brought out are encouraging to the possible development of sulphite waste liquor recovery.

"Mr. B. R. Tunison said that probably ten times as much alcohol as was consumed before prohibition days would eventually be utilized by the American people, albeit, they have decided to dispense with it as a beverage. In a normal year the United States drank 169,000,000 gallons of alcohol and used approximately 100,000,000 gallons in the various arts.

"Among the sources which could be developed is the nipa palm which flourishes in the Philippines and other tropical countries, and yields, said Mr. Tunison, about 15 per cent of sugar which could be fermented. From that source alone 50,000,000 gallons a year could easily be produced. The Mexicans brew a fiery beer from the sotol plant, a variety of agave which exists in very large quantities in their country from which millions of gallons could be distilled. By changing the cellulose of sawdust and other wood waste into sugar and then fermenting that substance, plenty more alcohol can also be obtained. It is identical with that derived from grain and is quite different from the methyl or so-called wood alcohol of the 'Pink Elephant' brand which is made by another process. Considerable alcohol can also be derived from the waste of gas works.

"In order to bring all these alcohols within the domain of the law, however, they have to be denatured or treated in such a way as to make them unfit for human consumption. There are now about 40 denaturing formulas which are approved by the Internal Revenue Bureau. When alcohol is used 'simple of itself' as honest Falstaff used to say of sack, the government puts on a tax of $4.15 a gallon even if employed for industrial purposes.

"These undrinkable alcohols are used excessively as solvents in the various chemical industries and especially in the development of the rapidly growing dye industry. They can serve all well in the manufacture of

rosins as a solvent, and by their use a perfectly transparent product can be manufactured.

"Mr. Tunison prophesied that as the petroleum supply decreases and the price of gasoline is therefore raised, alcohol will come into greater use as a motor fuel. Denatured ethyl alcohol, identical in composition with that distilled from grains, is now cheap in car load lots, and there are compounds of it which are sold even now for only a few cents more a gallon retail than the price of gasoline. Mr. Tunison said that these new alcohol fuels yield more power to the gallon than does gasoline and do not clog carburetors.—*The Literary Digest,* Dec. 6, 1919.

AERONAUTICS

BATTLESHIP AND AIRPLANE.—London press dispatches, writes a navy correspondent, quote Admiral Sir Percy Scott, inventor of the fire control system, as saying in an interview on October 31:

"The battleship is dead. The great fighting machine of the future will be the airplane, which will develop rapidly. I have seen the British Navy change from sails to steam, from fighting on the water to fighting under and over the water now. Now the question is, what is the navy of the future to be? Battleships were dead before the war, and I think they are more dead now. A battleship costs $40,000,000 and carries 1000 shells containing 100,000 pounds of high explosives, with an effective range of 15 miles, but is vulnerable to aircraft with bombs and aerial torpedoes, and to submarines carrying 15- or 18-inch torpedoes. For $40,000,000 we could build many airplane-carrying ships equipped with airplanes carrying 100,000 pounds of explosives. It takes a battleship weighing 30,000 tons to carry 100,000 pounds of explosives. Ten airplanes of three tons each should carry the same amount."—*Army and Navy Journal,* Nov. 22, 1919.

THREE MILLIONS FOR NAVY DIRIGIBLES.—Secretary Daniels has had estimates prepared which he will lay before the House Committee on Naval Affairs asking appropriations of $3,000,000 for lighter-than-air ships. The navy is prepared to build one or more dirigibles of an improved type should funds for material be provided. There is considerable sentiment among navy officers for a policy of original development and a strong belief that in design and construction the navy is capable of turning out the largest and most advanced type of dirigible without going to school to the builders of these ships overseas. The contract for a ship of the *R-34* type, for which Congress appropriated $2,500,000, has not yet been let to the English builders.—*Army and Navy Journal,* Dec. 6, 1919.

STUDY OF AEROLOGY IN THE SERVICES.—The establishment by the Navy Department of a school to train men in the science of aerology, as the exploration of the free atmosphere has been called since 1906, marks one of the two steps taken by the government for the study of this subject, now so necessary to the success of aviation both in a military sense and commercially. The army has requested that accommodations for 14 aviators be provided at the school to co-operate in this new study. The second step made by the government is the establishing of a board comprising two army and two navy officers and two representatives of the Weather Bureau who have been working on the problem of meteorological adjustment covering the upper air. In the army and navy it is suggested that a system of upper air observation be established and reports transmitted to a central point, where they may be disseminated by telegraph and wireless as is now done in Great Britain. The meteorological adjustment desired is first for the United States and then with Canada and South America. In this connection it will be recalled that when the British

dirigible *R-34* arrived at Mineola, Long Island, on July 6, on the first tranatlantic trip of this type of airship, the meteorological officer of the dirigible stated that it was his experience that the weather reports issued by the governmental weather bureaus were absolutely of no use once an airship rose to the great heights, at which they now travel, and that aerology was an undeveloped science in so far as practical aviation is concerned. Air Service officers attempting flights for altitude records in our army have also demonstrated how little we know of meteorological conditions in the upper strata.—*Army and Navy Journal,* Nov. 22, 1919.

NAVY "MOTHER SHIP" FOR BALLOONS.—The Navy Department has arranged to equip, as tenders for the fleet, two "mother ships" for lighter-than-air craft. The mother ships will be of the Type B Shipping Board vessels, single screw, about 8500 tons and length about 500 feet, each equipped with two hydrogen generators and three compressors. The equipment will take care of the kite balloons used by the fleet. The ships are now building at the Hog Island shipyard.—*Army and Navy Journal,* Nov. 15, 1919.

ARMY AND NAVY AIRCRAFT POLICY.—The Secretary of War directs that upon the recommendation of the Joint Army and Navy Board on Aeronautics, the following policy concerning the use of aircraft by the army and navy has been approved by the Secretary of War and Secretary of the Navy, and is published for information and guidance of all concerned:

1. Aircraft operated in conjunction with either military or naval forces shall be military or naval aircraft, respectively, and under the command of the respective military or naval commanders.

2. Both the army and navy shall confine the use of their aircraft to activities clearly connected with strictly military or naval functions as such are defined by existing laws and agreements.

3. To prevent duplication, and secure co-ordination, plans of new projects for the construction of aircraft for experimental stations, for coastal operating stations, or for extensive additions thereto shall be submitted to the Joint Army and Navy Board on Aeronautics for recommendations.

4. In the interests of economy, heavier-than-air craft shall be used instead of lighter-than-air craft whenever the former can perform satisfactorily the required work.

5. Whenever possible, training and other facilities of either service shall be made available for, and used by, the other.

6. Each service before entering the market shall attempt to secure aircraft of the type desired from or through the other service.

7. As soon as any experimentation is inaugurated, all information pertaining thereto shall be exchanged between the Army and Navy Air Services.

8. All estimates for the army and navy programs shall be presented to the Joint Army and Navy Board on Aeronautics for review and recommendation before submission to Congress.

9. *Functions of Aircraft.*—(a) Army: For offensive and defensive work in the field in conjunction with the various arms of the service. For general purpose of fire-control and fire-control information in connection with the coast defence. (b) Navy: For use from coastal stations for convoy, reconnaissance and patrol. For use from war vessels, bases and carriers for reconnaissance and spotting, and for offensive operation against enemy vessels and naval bases.—*Army and Navy Journal,* Nov. 8, 1919.

CAUSES OF AIRPLANE FATALITIES.—From January 1, 1918, to October 23, 1919, the Air Service of the army has had 390 fatalities at flying fields in the United States. Of these 14, or 4 per cent, were attributed to failure of engine, or collapse of plane. The cause of 9 per cent of all fatalities

is unknown. The causes of fatalities and the number of each class include: Tail-spin, 118; collision, 61; nose-dive, 47; unknown, 36; side-slip, 21; stall, 19; fire, 15; failure of machine, 14; struck by propeller, 13; others, 46.—*Army and Navy Journal*, Nov. 8, 1919.

CAPTAIN SMITH WINS AUSTRALIAN FLIGHT.—Captain Ross Smith, Australian aviator, arrived here to-day (Dec. 10) winning the $50,000 prize for the first flight from England to Australia.

Captain Smith set out yesterday from Bima, Dutch East Indies, 916 miles from the nearest landing place on the Australian coast. This flight, over volcanic islands and uncharted seas, was the most dangerous lap of the air voyage.

Surprising adventures were encountered in Java. Near Surabaya, Smith was compelled to land by engine trouble, and became heavily bogged, even the under carriage sinking in the mud. He rounded up 200 blacks from neighboring villages and made them dig out the machine and cut thousands of bamboo, constructing a bamboo track over the bog. Taxying over this he got into the air.

The England-to-Australia air race was the most spectacular and thrilling contest ever attempted. The prize of $50,000 was offered by the Australian Government. Captain Ross Smith left the Hounslow aerodrome near London, November 12, on the 11,500 mile flight. He crossed Europe and Asia, flying over France, Italy, the Balkans, Turkey, Persia, India, Siam and Java.

One of the conditions was that the flight must be accomplished in 30 days. When India was reached, the flight developed into a thrilling contest between Ross Smith and Etienne Poulet, a French flyer. They were only 45 minutes apart when Rangoon, India, was reached, but from then on the Australian outdistanced his competitor.—*Washington Times*, Dec. 10, 1919.

SPEEDS AT HIGH ALTITUDES.—According to the experimental data in the possession of the technical sections of the Air Service it has been found that at a height of 20,000 feet an engine gives only 45 per cent of the power for which it is good at sea level. The great value of the surcharger now being used with some engines lies in its ability to make a motor yield the same power at 20,000 feet that it does in flying at the lowest altitudes. Whereas the Lepere biplane, recently used by Major R. W. Schroeder in an altitude record flight of 31,800 feet, with one passenger, is capable of a speed of 136-137 miles per hour at sea level, at 25,000 feet, where most of the air fighting is expected to take place in the next war, the machine equipped with the surcharged has shown a speed of 134 miles.—*Scientific American*, Nov. 15, 1919.

UNITED STATES NAVY TO OPEN THE WAY FOR TRANSPACIFIC FLIGHTS.—The United States Navy is opening the way for transpacific flights. The *New York Tribune* for September 28 made the following announcement:

"The Navy Department has decided to start the land-and-water flight to Brazil before the end of this winter and to launch the first transpacific attempt before June, it was learned to-day.

"Plans for the first venture call for a start from Hampton Roads. It will constitute the first test growing out of the experience gained in the transatlantic flight. The planes which will likely be improved ships of the *NC* type, will follow the coast to Key West before crossing the Caribbean to Rio de Janeiro.

"Mother ships, such as were employed in the *NC* journey from Rockaway to Plymouth, will not be used.

"The transpacific flight will start at San Diego. No attempt at speed will be made. As the hazard is greater than in the transcaribbean flight,

and the distance longer, destroyers from the Pacific fleet will act as station ships to guide the fliers on their 7000 mile journey.

"The navy's program for equipping all bases with aviation facilities calls for the maintenance of landing places at every naval establishment on both coasts.

"While most of the naval bases on the Atlantic coast already have provisions for the reception of seaplanes, the aviation division of the Navy Department intends to have stationed at all naval bases sufficient mechanics to care for planes that put in there, as well as covered buildings to house the huge sea birds.

"The program likewise calls for the expansion of naval aviation to include a full division of seaplanes for both the Atlantic and Pacific fleets. Four major vessels in each fleet will be especially equipped to carry fast scouting planes."—*Aerial Age Weekly*, Oct. 6, 1919.

BRITISH ABANDONMENT OF AIRSHIPS.—The decision of the British Government to cease work on rigid airships has caused surprise, increased somewhat by the news that airships, airship stations, stores, etc., are to be placed, on agreed terms, at the disposal of persons interested commercially in the construction of airships, with the idea that they follow up the commercial development of this type of airship. While it is believed that nothing can stop this development, and that many firms might even attempt to inaugurate air mail service to America, the withdrawal of such state assistance and support as rigid airship building has hitherto received might make it difficult for private enterprise to cope with the cost without a subsidy.—*Scientific American*, Nov. 29, 1919.

GERMAN PRAISE FOR THE LIBERTY MOTOR.—Just before the armistice, the British bomber, *Hyderabad No. 3*, fell into German hands. The engine, which was a Packard-built Liberty twelve of the standard army type, was apparently uninjured and gave the German engineers full opportunity to investigate its construction and performance ability. In *Mechanical Engineering* (New York, August) are reproduced some of the results secured by them and published in a German technical periodical, *Der Motorwagen*. The account is both descriptive and critical and only one fault is found—the direct connection of the motor, which the German critic thinks should have been fitted with speed-reducing gear. Says the paper named above: "The following comment is given: The curve of output, as function of the number of revolutions, is unusually good, which is ascribed mainly to well-selected valve-opening cross-sections together with moderate velocity of the flow of gases through the valves. The fuel consumption . . . . is called very good for 'foreign' (which means non-German) engines. The output was 381 horsepower, which is somewhat less than the nominal rating of 400 horsepower, but it is stated that it is likely that an output of 400 horsepower could be secured at that speed with a different setting of the carburetor.

"The weight of approximately 1 kilogram per horsepower is said to be very good.

"The general opinion of the motor is that its construction and weight are very good, and that the ignition system is novel. The only objection made as regards the ignition system is in respect to the starting of the engine.

"The direct drive of the air-propeller is considered to be a basic defect of construction, in that with a motor of such a high output it is possible to secure an efficient propeller operation only by reducing the speed in revolutions. It is considered desirable that the motor should be equipped with a reducing gear.

"In order to increase the output, it would be further necessary to raise the speed of revolution of the motor as high as possible, ... which

would, however, necessitate a re-design of the pistons and connecting-rods. In this way it might be possible to raise the motor output to about 500 horsepower."

In its editorial pages, *Mechanical Engineering* makes the following comments:

"It is hardly possible to suspect the Germans of partiality to the production of our War Department, which makes their opinion particularly interesting.

"There is no doubt but that the German engineers were most favorably impressed with the design and performance of the engine. Their tests have confirmed practically along the whole line the results of similar tests made, for example, at McCook Field by the Aircraft Engineering Department of the War Department and published by special courtesy of the War Department in the March issue of this journal.

"In fact, the only serious criticism made by the German engineers is that with a motor of such tremendous power direct propeller drive was used. This criticism, however, has nothing to do with the design of the motor itself, and, as a matter of fact, is by no means new to our own engineers, as a vast amount of work was done by the Aircraft Engineering Department in the United States along lines of developing a reduction transmission for aircraft propellers to be used with the Liberty motor. Not only that, but at the time when the armistice was signed, a most interesting design was actually developed and extensively tested out and would probably have been used had not the armistice brought about a slowing-down of the work of production and development.

"Particular attention is called to the German data on the fuel consumption of the Liberty motor, which, if anything, are even more favorable to the motor than similar data officially published in this country."—*The Literary Digest*, Sept. 13, 1919.

MISCELLANEOUS

BELLIGERENTS' WAR VESSEL LOSSES.—In the course of the world war nearly a million and a quarter tons of naval shipping were lost. By countries, these losses were as follows:

Great Britain: 13 battleships, 3 battle cruisers, 25 cruisers, 6 monitors, 64 destroyers, 10 torpedo-boats, 58 submarines, 27 patrol boats; total, 550,000 tons.

France: 4 battleships, 5 cruisers, 14 destroyers, 8 torpedo-boats, 14 submarines, 9 patrol boats; total, 110,000 tons.

Italy: 3 battleships, 2 cruisers, 1 monitor, 10 destroyers, 5 torpedo-boats, 8 submarines; total, 75,000 tons.

Japan: 1 battleship, 4 cruisers, 3 destroyers, 1 torpedo-boat; total, 50,000 tons.

United States: 1 cruiser, 2 destroyers, 1 submarine; total, 17,000 tons.

Germany: 1 battleship, 1 battle cruiser, 24 cruisers, 72 destroyers, 51 torpedo-boats, 205 submarines; total, 350,000 tons.

Austria: 3 battleships, 2 cruisers, 3 monitors, 5 destroyers, 4 torpedo-boats, 8 submarines; total, 65,000 tons.

The Entente losses therefore amount to 802,000 tons as against 415,000 tons on the part of the Central Powers.—*The Nautical Gazette*, Nov. 1, 1919.

NAVY TO TRY WESSELS HERE AS GERMAN SPY.—Steps for trial by court-martial of Herman Wessels, alias Carl Rodiger, alleged German spy, and officer of the German Navy, arrested May 1 last year in New York City, and indicted by a Federal Grand Jury on charges of treason and conspiracy to commit espionage have been taken by the Navy Department.

Wessels, who has been confined in the Tombs Prison since his arrest, has not been brought to trial on the indictment, because of a court ruling

in the case of another alleged spy arrested with him that conviction of treason, under the Constitution of the United States, required two witnesses to each overt act.

For that reason the Attorney General, through the United States Attorney in New York, last July requested the Navy Department to take cognizance of Wessels's case and try him as a spy by naval court-martial, under authority of the statutory articles giving the navy jurisdiction in cases of espionage or "corruption" directed against the navy.

Charges of espionage against Wessels have been formulated by the naval authorities and a court for his trial has been organized in New York.

This is the first case of alleged espionage during the war over which the navy has assumed jurisdiction.—*New York Times*, Nov. 6, 1919.

AN UP-TO-DATE MUTINY.—Historians inform us that the term mutiny first came into use in the sixteenth century, when it was applied to the action of the Spanish troops sent to invade the Netherlands, who refused to obey their officers further until they had received their long outstanding pay. This act of insubordination was simply a strike on the part of hired soldiers to obtain the money justly due them for past services. Revolt against the inhuman treatment of a ship's commander or the serving of uneatable food account for most of the mutinous conduct which has taken place at sea. Mutinies for the purpose of gaining possession of a ship's cargo were comparatively rare and were almost exclusively confined to vessels laden with gold or silver bullion.

Something quite unusual in the world's history, however, is the recent rebellion of the Italian merchant seamen against constituted authority for a political object. When the steamer *Persia*, of the Lloyd Triestino, sailed not long ago from Genoa for the Far East with a cargo of 30,000 rifles, 20 batteries of mountain guns and other munitions for use aginst the Bolshevists, the crew mutinied as soon as the vessel reached the Mediterranean and forced the captain to put into Fiume. Here the arms on board were promptly unloaded. This is not the only pirate ship to reach the hotly contested-for city, and the head of the Italian Federation of Seamen is quoted as saying that further ships with cargoes useful to the Italian forces occupying Fiume will be turned from their course and directed to that port. The national sentiment is so strongly in favor of the annexation of Fiume that the Italian Government is probably helpless in the premises. So the instigators of this new-fashioned form of mutiny are not likely to be severely punished.—*The Nautical Gazette*, Nov. 1, 1919.

WHAT REMAINS OF THE GERMAN NAVY.—The explanation which accompanies the naval budget shows the following changes which were to be made in the navy in performance of the peace treaty. Both the Admiral Staff and the Navy Department (Marine-Cabinet) disappear. The estimate is based on the force of 15,000 men which Germany has been granted. The navy personnel comprises: 594 sea officers, including 13 admirals, 152 naval engineers, 580 deck officers and 12,218 non-commissioner officers and men. There will be two naval schools, one at Flensburg and one at Kiel. Four hundred thousand marks have been granted for artillery firing practice, 130,000 marks for torpedo firing practice and 77,000 marks for torpedo trials. The extraordinary budget requires 120.6 million marks from which the expenses resulting from the carrying into effect of the peace treaty—first of all the sweeping of mines—will be paid. There are two mine-sweeping divisions in the Baltic, 2 mother ships, 118 steam trawlers, torpedo-boats and other ships. In the North Sea there are 3 ships of the line as watch ships, 4 mother ships, 234 ships of all kinds. The military personnel for the mine department (Mynwezen), comprises 651 sea officers, 106 naval engineers and 14, 034 men.—Nov. 6, 1919.

HOLLAND REDUCES ESTIMATES FOR HER NAVY BY $5,000,000.—Holland is one of the first countries to carry out the ideas of the League of Nations and resort to disarmament. She has reduced her navy estimates for the coming year by over $5,000,000, and a great number of vessels will be sold or scrapped, and many officers retired.

Minister Mapine, in a speech to the Chamber, said he regretted that he could not go still further in the reduction of the navy, but the League did not offer the world the peace it had hoped for, and the deportment of some members of the League did not point in this direction, either.

There has been no decrease in the strength of the army.—*New York Times*, Dec. 1, 1919.

FICTION AND FACT ABOUT GERMANY.—The oft-repeated statement that Germany does not consider herself to have been beaten and that she is already looking forward to and preparing for the next great war, is the most amazing of the many wild and impossible rumors that fill the air in these days of psychological stress and storm. Ludendorff does not think that way, and surely he ought to know. Those of us who read his book noticed how he reiterated his warning to the civil government that, if the German nation did not stand fast, and if the German Government should fail to send the necessary reserves and munitions to the front, the Germans would have to face that complete military annihilation which has now fallen upon them.

If there is one outstanding feature in the German collapse, it is the fact that as a *military* people they ceased to exist and cannot function again for at least a generation to come. German pride was manifest in many directions, but in none so supremely as in that of their great military prowess; and a comparison of the Germany of 1914 and the Germany of to-day has brought home to that proud nation—not merely to its military chiefs, but to the simplest peasant who is at all conversant with the facts—a conviction that, militarily, she is absolutely impotent.

Look at the facts: In 1914 she possessed an army of 6,000,000 men, exclusive of reserves, backed by the greatest aggregation of military material and supplies the world has ever seen. To-day that army is disbanded and its strength reduced to a police force of 100,000 men. Thousands of the pick of her guns have been handed over to the Allies, and her great fleet of military Zeppelins has been or will be similarly handed over or destroyed. In 1914 Germany boasted, and justly so, of her great modern fleet. To-day it lies in the mud beneath the waters of Scapa Flow. Her submarines have been surrendered; she may build no more of them; and those she is building must be destroyed. Her future fleet may consist of no more than a few third-class battleships and cruisers. In 1914 Germany's merchant marine, including the largest and most sumptuous passenger liners afloat, had reached out to every corner of the world; and her flag was symbolical of the vast commercial expansion of a great industrial people. To-day by way of reparation for her submarine ruthlessness that fleet has been divided up among her enemies, and she is under pledge to build for the Entente many millions of tons until the process of reparation is complete.

So far, then, as the material of war is concerned, in an age when a superabundance is essential to military success, she finds herself stripped absolutely naked. Transportation is indispensable to military operations on a grand scale; yet the German people have seen their best locomotives passing by the thousand, as reparation, into the hands of the enemy, and their freight cars by the hundreds of thousands. No, Germany is not thinking of the next military war. It is our firm conviction that things military come last of all in the list of her preoccupations. The military masters of Germany promised her military supremacy. They have given her military extinction—and the German people know it.

What then is it that this stricken nation is thinking about and planning for in these days of humiliation? There is every evidence that her thoughts are turned toward one thing, the obvious thing—the rebuilding and upbuilding of her financial and industrial establishment. Every military asset has been taken from her. She still retains her great, very capable, industrious and well-disciplined man-power; and if those hectic individuals who are running around, trying to make us believe that Germany contemplates a military revival, will but look the plain facts in the face, they will understand that German common sense and practical hard-headedness have shown the German people that there is just one thing to be done with her man power, and that is to go to work seriously, earnestly, and unremittingly, to build up again that great industrial Germany which before the war had won the recognition of the whole world. There is in the German an inherent love of order, and an inherent capacity for hard work. Moreover, the military system, broken and scattered to the four winds though it is, has left behind an invaluable legacy, in the habits of order and discipline which that system has stamped upon a people that was congenitally ready to receive it. Already we have seen evidence that these qualities are enabling the people to pull themselves together and to address themselves to the herculean task ahead of them. Witness the speedy overthrow of the Spartacus movement and the admirable way in which the new democratic government, with the thunder of the Bolshevistic storm about its ears, has held together and set about the joint task of complying with the terms of the armistice and getting the country back upon its feet.

Germany has lost the military war, but she means to win the economic war if she can. It certainly looks as though labor might win where the soldier has failed; for there can be no denying the fact that, of all the late warring nations, Germany has gone to work in a way that should put some of her late enemies to the blush. Although there have been many strikes in Germany they have been comparatively short-lived, and there is every evidence that labor is bending itself to the task with a fine touch of patriotism.

But what of these United States? We outmatched the German in war; are we now to fall behind him in turning from the arts of war to the arts of peace? Is it possible that the record of the sacrifice of our boys on the bloody fields of France is to be followed by a record of wasteful extravagance and a general letting down of effort in the fields of industry and commerce? So great is the world's sorrow that the demand for an increased economic activity is more than economic—it is a moral demand, and, as such, should strike a quickly responsive chord in every American heart. The world's crisis is our crisis and the call for greater output from our farms and factories is the call of humanity. What then shall be said of those professional agitators who are inciting labor to demand, in addition to more pay, which in the majority of cases should be given, reduced hours of work with the resulting reduced output to meet the crying demands of a suffering world? Not by the road of idleness but by that of earnest and well sustained labor is to be found the solution of the present distresses of America and the whole world.—*Scientific American*, Nov. 29, 1919.

HEAT TREATMENT IN GUN EROSION.—There are few problems in the metallurgical and allied arts that have proved more puzzling to the investigator, or have received a more thorough investigation than that of the causes and cure of gun erosion. Perhaps the clearest and most complete discussion of this subject is that of Professor H. M. Howe, in a paper read at the latest meeting of the American Institute of Mining Engineers. He showed that erosion was the effect of heat treatment, due to the extreme high temperature of the powder gases. Any sudden heating and cooling, as we have long known, has the effect of hardening the surface of

the bore. In a badly eroded gun the thickness of the hardened layer varies from one ten-thonsandth of an inch at the muzzle to sixy-three ten thousandths at the breech. Dr. Howe does not agree with the widely held theory that this hardening is due to carburization; he believes it merely a result of heat treatment. There is too much carbon dioxide in the powder gases to permit carburization by the monoxide.

Now we must remember the heating up of the liner is very rapid and lasts for a very small fraction of a second. An extremely fine film of the metal is suddenly raised above melting point; but the wave of heat starts flowing away to the exterior of the gun. The ferrite and cementite in this heated form merge and form austenite. As the heat passes out through the gun, the metal just beyond the thin fused film cools below the limit at which transition to austenite can occur. After the projectile has left the gun, the layer in which austenite has been formed cools again, and this cooling is accompanied by some reversion in the steel toward its original condition. This reversion of phase takes more time to effect than the change of the gun steel to austenite. Some of the latter therefore remains unaltered and, being rapidly chilled, is converted into martensite. On each successive discharge additional austenite is formed and in this way the thickness of the hardening layer increases progressively. The result is that the original tough face of the liner is replaced by a hard, brittle layer of martensite. Since the temperature gradient of this layer is very steep, the transformed metal is too brittle to adjust itself to the resulting differential expansions, and cracks are formed. On the lands of the rifling these are generally transverse, but in the grooves the principal cracks are longitudinal.

But why is the bore of the gun enlarged? What becomes of the metal that is worn away? Professor Howe agrees with the view we have long taken in this matter: That since a fine film of the interior surface is fused by the heat of the white-hot powder gases, the gases in rushing forward out of the gun, wipe off and carry away a certain amount of this film. The quantity is small enough at each discharge, but the accumulated wastage of many rounds serves gradually to enlarge the bore, especially towards the breech of the gun.

Although the nature and progressive effect of erosion are thus satisfactorily explained, there is not much prospect of any successful remedy being applied. The Krupp firm in Germany has from time to time asserted that they had produced a non-erodible steel; but samples cut from captured German guns show that while the metal is of good quality it contains no new ingredients.—*Scientific American*, Nov. 1, 1919.

GERMAN SHIPPING.—Despite the fact that Germany is now being pictured to the world as in the throes of economic collapse, there are many evidences of vitality that seem to contradict this. Perhaps this pathetic note has been touched in the hope of relaxing some of the indemnities of the peace treaty. In other words, there is a strong suggestion that Germany is not as badly off as she would have us believe, and it looks as if she were resorting to propaganda for her special benefit.

Some days ago there arrived in the port of Havana, Cuba, the first German steamship to reach that city since July, 1914, and she carried a general cargo. She is now loading sugar for Hamburg. Furthermore, various interned German vessels have left their Latin-American anchorages and are taking cargo for the Fatherland. Within the past week three such ships sailed from Chile.—*Shipping*, Nov. 19, 1919.

GERMANS TO PAY FOR TREACHERY.—The Germans are squirming under the penalties imposed on them by the Allies for their treachery in sinking their surrendered ships at Scapa Flow. A German delegation summoned to Paris for November 10 to sign the necessary papers for reparation did

not appear on the date named. It has been decided by the powers that the peace treaty shall not go into force until Germany has given guarantees to make good, under these demands:

Surrender of five light cruisers—*Konigsberg, Pillau, Graudens, Regensberg* and *Strassburg*, is demanded; to be delivered in 60 days.

Floating docks, floating cranes, tugs and barges equivalent to a displacement of 400,000 tons; to be delivered in 90 days.

A complete list of all floating docks, floating cranes, tugs and barges that are German property, to be delivered in 10 days.

The officers and men who made up the crews of the vessels sunk at Scapa Flow, now detained, will not be released until the foregoing provisions have been carried out.

The machinery and engines of four submarines must be surrendered to offset the destruction of the *UC-48* by her officers after Germany's surrender, and the loss of other submarines in the North Sea; to be delivered in 10 days.—*The Marine Journal*, Nov. 22, 1919.

SALVAGE WITH FLEXIBLE PONTOONS.—Recently some interesting and indeed valuable experiments have been carried out in the raising of the steamer *Main*, which was sunk by gunfire by a German submarine in Luce Bay during the war. The Ardrossan Salvage Company, Glasgow, undertook to test in the salvage operations some flexible pontoons designed, patented, and manufactured by Messrs. Vickers, Ltd., of Barrow-in-Furness. The pontoons are made of special canvas and cables, and weigh when completed only one ton, but when inflated with air and submerged in water they are capable of lifting 100 tons. On the trials two of these 100-tons pontoons were fixed to the sternpost of the ship, and inflated by an air compressor on a tug. The vessel was slowly raised and beached. The amount of rough handling which the pontoons withstood was remarkable. One great advantage of the pontoons is that they can be packed into very small compass and stored in the hold of a salvage ship, and need only be brought out when required. The designers are confident that pontoons of 200 and 300 tons lifting capacity can be made in the same manner. By the use of this device it will be possible to raise practically any vessel that a diver can reach and be able to fix such things as shackles, etc. The designers say the pontoons can be increased in size, and it will then become possible to tackle such large ships as the *Lusitania*. As they can be made to lift 500 tons each, a battery consisting of about 80 pontoons would suffice to lift the ship so that she can be towed into shallow water. She could then be repaired, pumped out, and refloated at high tide.—*The Nautical Gazette*, Oct. 11, 1919.

HOLLAND BEGINS TO RECLAIM THE ZUYDER ZEE.—Work has begun at last on the long-projected plan for the reclamation of the Zuyder Zee. It marks the fulfilment of an old-standing dream of Holland which has been debated for just over 70 years. It is an imperialistic enterprise in annexation without bloodshed and without damage to anybody.

The scheme in brief aims at reclaiming for tillage and pasture an area of some 600 square miles which was violently annexed by the sea 700 years ago at the cost of 80,000 lives and at turning the remaining 500 square miles of channel between the reclaimed portions of land into a sweet-water lake fed by the River Ijsel (a branch of the Rhine) and protected against the sea by a dyke 183 miles long between the island of Wieringen and Piaam on the coast of Friesland.

The reclaimed land will consist of four "polders" surrounding the lake, which are expected eventually to supply a living to close upon a quater of a million people. The work will spell the death-knell of the present fisheries and fishing fleet, but the gain from the formation of a new arable

land, and the acquisition of a huge sweet water reservoir, will more than compensate for this loss.

The Dutch have, during the last three generations, added to their territory not less than 2,000 square miles, exclusive of the present scheme.—*The Nautical Gazette*, Oct. 4, 1919.

THE GERMAN SHIPS IN THE EAST INDIES AND IN CHILE.—All the German ships lying in the Dutch Indies have been handed over to England. They are to go into dock at Singapore and will there receive their English crews.

With regard to the ships which recently went ashore in Chile during a storm, it is stated that owing to the intervention of the English Government, the German owners will only be permitted to sell the vessels on condition that the amount received for them be deposited with a court of law until such time as the right of ownership has been determined in accordance with the terms of the peace treaty.—Aug. 27, 1919.

A NEW USE FOR ICE.—Up to the present it has been possible to make only small cavities in concrete; but under a new German patent a big advance appears to have been brought about. Pieces of ice, corresponding to the measurements of the cavity required, are embedded in the concrete mass, and small channels are introduced to allow of the rapid removal of the water after melting. In this way not only can small concrete constructions, such as pillars, beams and stairs, be supplied with a hollow space, but large fixed blocks can be made with several chambers, such as are required for walls of houses or ships. The process is of particular advantage in reinforcing concrete with iron. The iron parts are not built in during the stamping, but are attached to the ice blocks before the beginning of the work, which increases its strength. The continual moistening usual in concrete work is rendered unnecessary by the new process, as the loss by evaporation is made good from the melted ice.—*Scientific American*, Nov. 22, 1919.

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Heavy Oil Engines for British Submarine Boats. *Engineering* (London), July 4, 1919.

What of the Navy? By John Leyland. *The Nineteenth Century and After*, October, 1919.

Progress of Aviation in the War Period. Supplement to the *Aeronautical Journal*, July, 1919.

The Romance of Military Insignia (illus.). By Col. Robert E. Wyllie, U. S. A. *National Geographic Magazine*, December.

The Obligation to Ratify Treaties. By John Eugene Harley. The American-German Conference on Prisoners of War. By Commander Raymond Stone. *American Journal of International Law*, July.

The Last Naval Battle of the Revolution. By Edgar Stanton Maclay. Control of the Pacific. *Sea Power*, November.

Shall We Keep Our Commerce Supreme. By Lord Blyth. *The Nineteenth Century and After*, November.

Economy in the Fleet: Lord Fisher's Demand. By Archibald Hurd. The New Middle East in the Making. By Robert Machray. *Fortnightly Review*, October.

The Navy and Lord Fisher. By Admiral E. R. Freemantle. *United Service Magazine*, November.

NOTES ON INTERNATIONAL AFFAIRS

NOVEMBER 15 TO DECEMBER 15

PREPARED BY

ALLAN WESTCOTT, Associate Professor, U. S. Naval Academy

TREATY DEFEATED IN SENATE

On November 19 the Treaty of Peace with Germany failed of ratification in the Senate and the Senate adjourned until December 3. On the question of ratification with the Lodge reservations, the first vote was 39 to 55; and after motion to reconsider, 41 to 50; the third and final vote, on ratification with no reservations whatever, was 38 for to 53 against, the majority on this last motion consisting of 46 Republicans and 7 Democrats.

On the same date Senator Lodge introduced a resolution declaring war with Germany at an end. This was referred to the Committee on Foreign Relations and has not since come up. On December 5 Senator Hitchcock stated that it was the President's intention to make at present no further move regarding the Treaty, regarding the responsibility as "shifted from his shoulders." On December 13 Senator Knox proposed two resolutions, one for ratification of the Peace Treaty without the League Covenant, and the other declaring peace with Germany subject to the President's approval and signature.

AMERICAN DELEGATES LEAVE PARIS.—On December 9 the American Peace Delegation, headed by Assistant Secretary Frank L. Polk, left Paris for the United States. Upon his departure Mr. Polk expressed the opinion that Germany would submit to all Allied demands, and called attention to Rumania's assent to the Austrian Treaty and the approaching completion of the Hungarian terms. The American departure was delayed a few days owing to Germany's refusal to sign the final protocol.

LONDON CONFERENCE OF DECEMBER 11-13

The British and French Premiers and the Italian Foreign Minister Scialoia met in London on December 11-13 to consider the main outstanding questions relating to the peace settlement. Pending an official communiqué, press reports suggested the following results: (1) substantial progress on peace terms to Turkey; (2) agreement to withdraw Allied aid to Russia, as clearly foreshadowed in Mr. Lloyd George's speech of November 17; (3) assurances that Great Britain and France would intercede with the United States for an early settlement of the Adriatic problem; (4) willingness on the part of the Allied Powers to accept American ratification of the Peace Treaty with most of the reservations proposed in the

Senate; (5) agreement to hold further conferences of British, French, and Italian leaders for settlement of the peace, with the United States if possible, represented.

LABOR CONFERENCE ENDED.—The first International Labor Conference was adjourned suddenly on November 29 after a session of one month, just prior to the arrival of the German delegates. In that time an organization was effected and a governing body created with 24 members, 20 from Europe and 2 from the Americas. Albert Thomas, the French Labor Leader, was appointed Director General, in charge of the International Labor Office. Five draft conventions were adopted, including one providing for general adoption of the 8-hour day and the 48-hour week. The first meeting of the governing body is to be held January 26, probably in London.

UNITED STATES AND MEXICO

RELEASE OF JENKINS FROM JAIL.—The following announcement of the State Department on December 5 makes clear the facts relating to the abduction of Consular Agent Jenkins and his subsequent imprisonment and release by the Mexican authorities:

The release of William O. Jenkins, the American Consular Agent at Puebla, Mexico, was reported late this afternoon from the American Embassy at Mexico City.

The Secretary of State announced that a dispatch from the embassy stated that Third Secretary Hanna of the embassy, who was sent to Puebla in connection with the department's repeated representations for the immediate release of Jenkins, had reported that Jenkins was released from the penitentiary last night.

Jenkins was abducted October 19, and the American Embassy was immediately instructed to take all possible measures to effect his release from the bandits who had robbed and kidnapped him. Jenkins was released on ransom, returning to Puebla October 26, was taken to a hospital on that date, and was arrested November 15 by the Mexican authorities and taken into custody.

The release of Consular Agent Jenkins was brought about by urgent diplomatic representations made by this government and the resulting investigation made by General Pablo Gonzalez, who was sent to Puebla by the Mexican Government to investigate the facts in the case. The investigation by General Gonzalez, who was at Puebla on December 3, had then practically substantiated the position taken by this government on behalf of Jenkins.

Two peons from Santa Lucia admitted to General Gonzalez that they had made declaration against Jenkins under threat of execution. Other witnesses testified they had been compelled to make false statements against Jenkins under duress. One witness was threatened with a pistol, another suspended by a rope, and still another beaten until he made his declaration against Jenkins.

These facts are shown in the court record of the case.

NOTE DEMANDING RELEASE.—The following is a translation from the Spanish text of the Note sent to Mexico on November 20:

American Embassy, Mexico City, Nov. 20, 1919.

To Hilario Medina, Sub-Secretary of Foreign Affairs, Mexico City.

Sir: Referring to previous communications in the case of the Consular Agent of the United States at Puebla, William O. Jenkins, I have the honor of informing you that I have received telegraphic instruction to notify the

Secretary of Foreign Affairs of Mexico, that in connection with the losses and injuries already suffered by Mr. Jenkins as the result of his being kidnapped—occasioned by the inability of the Mexican Government to give due protection and his first arrest by Mexican authorities, the government of the United States of America is surprised and exasperated to learn that Mr. Jenkins again has been arrested.

His new arrest seems to my government, according to the evidence before it, entirely unjustified and an arbitrary exercise of public authority.

The government orders me to add that the persistent persecution and subsequent harassing of Mr. Jenkins cannot but have a very serious effect on the relations between the two countries, for which the Mexican Government will be solely responsible.

Therefore, I am ordered to demand the immediate liberation of Mr. Jenkins. Accept, sir, etc.

(Signed) GEORGE L. SUMMERLIN, Charge d'Affaires.

—*N. Y. Times*, 28/11.

MEXICO'S REPLY.—The reply of Mexico to Secretary Lansing's demand was received on November 27. It explained the charge against Jenkins as false testimony in the courts, and declared the inability of the federal government to interfere with the courts of the state of Puebla. Secretary Lansing despatched a reply on December 1 renewing the charge of persecution and demanding release.

Mr. Jenkins was set free on December 5, the required bail of 1000 pesos having been supplied by a J. Salter Hansen, without authorization or knowledge on the part of the American Government.

It was subsequently stated (December 11) that the Mexican Supreme Court had the full records of the case and would render a decision as to whether the case should be continued in the state or federal courts. Pending this decision, the final Mexican explanation was delayed.

GERMANY DELAYS SIGNING OF PROTOCOL

DENIES RESPONSIBILITY FOR SCAPA FLOW SINKING.—At the close of November, Baron Kurt von Lersner, head of the German Delegation, submitted protests declaring Germany not responsible for the sinking of German battleships, since the German admiral was a prisoner not under Germany's control, and since the ships were not interned in a neutral port. In a statement to the press on December 3 the German delegates said Germany was ready to sign if the Scapa Flow question were referred to the Hague, and the paragraphs relating to the evacuation of Lithuania removed.

NO MODIFICATION PERMITTED.—Two notes were handed by the Supreme Council to the German delegates on December 8. The first opened as follows:

Mr. President: The Supreme Council has taken note of the verbal communication which you made on December 1 in the name of the German Government.

The notes of the 1st and 22d of November defined the responsibility of the German Government as to the delay in the ratification of the Treaty, and the conclusions thereof stand.

The suggestion concerning an alleged right of Germany to request (in compensation for the absence of American delegations on the commissions until the ratification of the Treaty by the United States) a modification of the clauses of the Treaty concerning the delivery of the guilty and the return of the prisoners of war, has no basis. Under the terms of the final clauses of the Treaty, that instrument must enter into force as soon as Germany and three of the principal Allied and Associated Powers have ratified it. It would be in vain for Germany to endeavor to subordinate the entry into force to a new condition, the presence of American delegates on the commission.

Continuing, the Note stated (1) that France will free prisoners only when the Treaty comes into force; (2) that "after having received a complete report on all floating docks, cranes, tugs, and dredges, demanded by the protocol, the Allied and Associated Powers will make known their choice, taking into consideration the general economic situation of German ports"; (3) that the signing of the protocol will determine the coming into effect of the Treaty; (4) that "until the Peace Treaty comes into force a denunciation of the Armistice is sufficient to give the Allied armies full latitude for any military measure they may deem necessary."

GERMANY RESPONSIBLE FOR SINKINGS.—The second Note declared (1) that Germany had previously acknowledged responsibility for the sinking of warships at Scapa Flow; (2) that the sinking was in accordance with secret communications from the German Admiralty; and (3) that the choice of Scapa Flow was in conformity with both the spirit and text of Art. 23 of the Armistice.

To these last notes Germany, on December 12, sent a reply of a temporizing, but conciliatory character, proposing that the indemnity tonnage question be referred at once to a body of experts.

FRANCE

ELECTIONS A VICTORY FOR CLEMENCEAU.—In the November Parliamentary elections in France, in contrast to the results in Italy, the extreme Socialists received a severe set-back throughout the country, and in general the Socialists suffered the defeat of many of their leaders. This was taken as an expression of hostility toward all forms of Bolshevism, and also as a result of cooperation among all non-Socialist parties, secured chiefly by the skill of Premier Clemenceau. These parties, the *bloc national,* will control some 500 of the 626 seats in the Chamber of Deputies.

FRANCO-BRITISH PROTECTIVE TREATY RATIFIED.—On November 20 the Treaty was formally ratified by which British aid is guaranteed to France, if without provocation she is attacked by Germany. The Treaty, however, does not take effect until the similar treaty between France and the United States is ratified.

ITALY

SOCIALIST GAINS IN ELECTIONS.—In the November elections for Parliament, the Socialists in Italy made decided gains, filling 156 of the 508 seats in the Chamber of Deputies. The Catholic party holds about 100 seats, and

the remainder are divided among various anti-socialistic parties, which with the Catholics support the ministry. The Socialist gains are generally interpreted as expressing merely the spirit of unrest in Italy and dissatisfaction with her opportunist policy in the war. The party leaders, however, afterward declared it an approval of Bolshevism.

Ex-Premier Orlando was elected President of the Chamber of Deputies by a vote of 251 to 143, and Ex-Foreign Minister Tittoni became President of the Senate. This is the first session of Parliament in six years. Nitti continues as Premier, with Vittorio Scialoia as Minister of Foreign Affairs.

FIUME PROPOSAL CONDEMNED.—On November 24 it was announced in the press that the United States Government was unwilling to approve the solution of the Fiume question offered by Italy in October. This solution was briefly as follows: Italy would receive Fiume and a strip of territory connecting it with Italy. Italy would build a port for the Jugo-Slavs at Buccari, and during its construction grant them special privileges and guarantees at Fiume. Zara would become a free port, with its foreign affairs under Italian control.

The Fiume question was later taken up at a meeting of Allied ministers in London during the second week in December.

D'ANNUNZIO TO AWAIT SETTLEMENT.—Following the triumphant occupation of Zara on the Dalmatian coast by d'Annunzio, and the support given to him by Admiral Millo in command of the Italian occupation forces, the Italian Government in a semi-official statement on November 22 condemned the Admiral's action and also gave assurances to Jugo-Slavia that no further efforts would be made to secure Dalmatian ports in violation of the Armistice arrangements. In the meantime a Serbian division, 12,000 strong, was reported at Spalato to guard it from capture, and 30,000 Jugo-Slav troops occupied Dalmatia.

D'Annunzio on December 7, assured the Italian Government and also issued a statement that he would make no new expeditions beyond the Armistice lines. On the 9th d'Annunzio's representatives returned to Fiume from Rome with information regarding the government's plans for a settlement.

AUSTRIA AND THE BALKANS

RUMANIA FINALLY SIGNS AUSTRIAN TREATY.—On December 3 the Supreme Council delivered a note to Rumania giving that country a final opportunity to sign the Austrian Treaty. The Note called attention to the unsatisfactory character of Rumania's previous replies, and stated that the only justification for the further extension of time until December 8 was the change of ministry in Rumania and the meeting of the new Parliament. Rumania signed the Treaty just prior to the expiration of the time set.

BULGARIAN TREATY SIGNED.—On November 27 the Treaty of Peace between the Allies and Bulgaria was signed at Neuilly, a suburb of Paris. The signing was not marked by elaborate ceremonies. Secretary Polk signed the Treaty as representative of the United States. M. Stambuliwski,

Premier and leader of the Peasants' Party which opposed the German alliance, represented Bulgaria. Rumania and Jugo-Slavia, not having at that time accepted the agreement with Austria, were not permitted to sign the Bulgarian Treaty, the Balkan states remaining thus technically in a state of war.

HUNGARIAN TREATY IN READINESS.—Upon his departure for the United States, Secretary Polk declared the Hungarian Treaty in readiness for signature, except for minor details. It was agreed by the Supreme Council that the Fiume question should not be settled in the Hungarian terms, but left for final decision by the Allied and Associated Powers. This would make it possible for Italy and Jugo-Slavia to sign the Treaty.

COALITION CABINET IN HUNGARY.—On November 25, under pressure from the Supreme Council, Hungary formed a coalition cabinet acceptable to the Allies, with Karl Huszar, a Christian Nationalist, as Premier. The new government was requested to send delegates to Paris, but notified the Supreme Council that the three delegates selected were interned by Rumania. The Supreme Council refused to intervene in this matter, but renewed its request for delegates.

RUSSIA

BRITISH AID WITHDRAWN.—In a speech in the House of Commons on November 17 Premier Lloyd George indicated the decision of Great Britain to give up the policy of intervention in Russia. "In whichever direction we go," he said, "we are marching into a fog." Referring to the Bullitt report, he declared that Bullitt had "betrayed the confidence" of Sir Philip Kerr (Lloyd George's secretary).

Reverting to the general question of Russia, the Premier referred to the operations of Admiral Kolchak, and emphasized the enormous distances, and the difficulty of England helping Kolchak.

"There are countries," he declared, "in a much better position to help Kolchak than we. These powers are next door. They are in the alliance. I do not wish to be considered as criticising them, but if there has been a failure it is not our failure."

Pointing out that nobody knew what Central Russia wanted, and that any attacks upon Bolshevism carried beyond a certain point had failed, the Premier declared that with Great Britain's own burdens it was quite impossible to go on financing civil war in Russia indefinitely.

"Our own country is our first concern," he said, "and there is no surer road to Bolshevism at home than financial bankruptcy. We have contributed more to anti-Bolshevist elements in Russia than France, Japan and America put together. I boast of that because it was an obligation of honor for us."

Mr. Lloyd George admitted the accuracy of the French press report that France and England were in agreement to withhold further supplies from Russia, because, as he explained, it was impossible further to burden the French taxpayer.

Dilating upon the almost insuperable difficulties of formulating a policy when on one side there were anti-Bolsheviki like Kolchak and Denikin fighting to reknit and reunite powerful Russia, and on the other side border states equally anti-Bolshevist, seeking their own independence, and therefore the disintegration of Russia, the Premier said:

"Will any wise man advise us to undertake the terrible responsibility of restoring order in a country as large as Russia, where no country ever intervened without landing itself into disaster? I cannot undertake such responsibility."

The Premier concluded by declaring that he did not fear Bolshevism in any well-governed land, but dreaded a wild adventure into lands whose condition was unknown, and where nothing but catastrophe had awaited every empire and every army that had ever made it.

A. J. Balfour, Lord President of the Council, pointed out that while there was much criticism of the Government for lack of a clear-cut policy on Russia, none of the critics had ever suggested a clear-cut policy of his own. —*N. Y. Times*, 2/11.

PEACE CONFERENCE AT DORPAT.—On December 4 a delegation from the Russian Bolshevist Government arrived at Dorpat, in Lithuania, to begin peace negotiations with representatives of the former Baltic provinces of Russia. It was stated that most of the Baltic provinces would be represented.

NEGOTIATIONS AT COPENHAGEN.—It was announced in press reports of December 10, that at a meeting in Copenhagen between Mr. James O'Grady, representing the British Government, and M. Litvinoff, representing Soviet Russia, for the exchange of prisoners, the Russian delegate made efforts to open general peace negotiations, which Mr. O'Grady refused to undertake. The Soviet Government has repeatedly indicated its desire for peace on the basis of non-interference in Russian affairs.

KOLCHAK GOVERNMENT REORGANIZED.—Following military disasters and retreat from Omsk to Irkutsk, an effort was made to reorganize the Kolchak Government, eliminating military control over civil affairs. The new "All-Russian Ministry" under Premier Pepeliaeff on December 1 issued a statement of policy, including elimination of military influence, extension of power to Zemstros, and friendly relations with Czecho-Slovaks.

FAR EAST

NO INTERNATIONAL CONCESSION AT TSING-TAO.—The Japanese newspaper *Yomsuri* on November 20 announced that Japan had decided not to establish an international concession at Tsing-tao, as suggested by Foreign Minister Uchida in September, but would maintain the concession exclusively Japanese.

TROUBLE OVER CONSORTIUM TO CHINA.—The plan for an international loan to China was held up by Japan's opposition to the inclusion of certain portions of Mongolia and Manchuria within the purview of the loan, on the ground of Japan's exclusive rights in those areas. To this objection, the United States replied that the Lansing-Ishii agreement, while it recognized Japan's special interests in certain parts of China, did not imply a Japanese monopoly or priority of economic rights not in accordance with the "open door."

Pending the settlement of the discussion, a plan was proposed by which the four powers were to advance $25,000,000 to relieve China's immediate necessities and prevent a collapse of the government.

ADDITIONAL TROOPS TO SIBERIA.—Despatches from Vladivostok on December 10 announced the arrival of several transports with fresh Japanese troops for Siberia. It was not made clear whether these were replacements or reinforcements to meet the advance of Bolshevist troops. According to press accounts, the sending of increased troops to Siberia aroused opposition from the Japanese people and press.

REVIEW OF BOOKS
ON
SUBJECTS OF PROFESSIONAL INTEREST

"Modern Theory and Practice in Radio Communication." By Assistant Professor Gordon D. Robinson, U. S. N. A., Department of Electrical Engineering, United States Naval Academy, and Lieut. Commander Paul L. Holland, U. S. Navy, Department of Electrical Engineering, United States Naval Academy.

The student of radio, or of any other subject, often finds it necessary to search through several books to find a particular phase of the subject covered in a lucid manner. One chapter may be good and the next rather vague. An effort has been made in this book to bring out certain points which will make the book appeal to all classes of radio students. The phases of the subject which are most often vague, or entirely omitted, have been fully covered and explained in accordance with modern theory.

Attention is called to the following points:

The electron theory is the basis of explanation of numerous phenomena. This is in accord with modern theory and renders the explanation in many cases quite simple.

The subject of wave propagation, with attendant phenomena, is discussed at length.

An unusually complete treatise on the three-element vacuum tube as applied to generation, detection, and amplification, is presented.

The fundamental principles upon which the design of receiving circuits, including interference preventers, is based, are covered in detail.

One chapter is devoted to the radio compass, or direction finder.

The book has been adopted as the text-book for midshipmen at the United States Naval Academy. An elementary knowledge of physics and electricity is presupposed, hence the chapters on electricity and magnetism are brief and devoted to the points not fully covered in an elementary text on electricity. The book is a theoretical treatise on radio and is not intended to serve as an instruction manual for either commercial or naval apparatus. A greater degree of permanence in use of the book is thus insured.

The contents follow:

Chapter I: Electron Theory—Electric and Magnetic Strains. II: Capacitance and Inductance—Energy of Charges—Condensers. III: Oscillating Circuits—Damped Oscillations—Buzzers—Wavemeters—Detectors—Resonance—Frequency—Decrement—Wave Propagation—Wave Length. IV: Coupled Circuits—Transfer of Energy—Mechanical Analogues. V: Three-Element Vacuum Tubes—Theory of Operation—Use as Amplifier and Generator. VI: Spark Transmitters—Gaps—Tuning of Circuits.

VII: Continuous Wave Transmitters—Arcs—H. F. Alternators—Radio Frequency Spark—Application of Three-Element Vacuum Tubes as Generators. VIII: Detectors. IX: Receivers. X: Radio Telephone. XI: Direction Finders. XII: Measurements—Formulæ. Appendix: Standardization Rules—Codes—Extracts from Laws Governing Radio Communication.

P. L. H.

"From Midshipman to Rear Admiral." By Rear Admiral Bradley A. Fiske, U. S. Navy. The Century Company.

Interwoven in this extremely interesting autobiography are three distinct narratives, each of which deserves close study by the present and coming generations of American naval officers.

The first is the author's running description of the stupendous and unprecedented changes in our ships since his entering the Naval Academy in 1870 and in the attitude of our naval officers towards the technique of their profession. He then found them on board of wooden vessels armed with muzzle-loading smoothbores, the winds of heaven the prime mover. They based their service reputations on old-fashioned seamanship alone. Gunnery was a hit or miss proposition and target practice a vexatious and disturbing quarterly obligation to be discharged and then forgotten for the ensuing three months. He has lived to command a squadron of modern steel battleships carrying high-powered breech-loading rifles and propelled by turbines. Sails are things of the past. Gunnery has become almost an exact science largely through his own contributions to that art. This story somewhat overlaps, in the beginning, Mahan's delightful volume "From Sail to Steam," with which it may be compared to the disparagement of neither writer, and it brings the account up to the present time. Every one who cares to follow the marvellous development of things nautical (and all naval officers ought to care) should read attentively Fiske's personal experiences, from which he will learn much that is valuable, and, incidentally, derive great pleasure in the pictures of old-time cruisers in home and foreign waters. Especially interesting among them is the Battle of Manila Bay in which he took part. Moreover, to his great gratification, he was able to demonstrate the utility of his range finder in actual engagement with an enemy. His account of the action leaves nothing to be desired in the way of fullness and accuracy. Like the rest of his adventures, it is told with the skill of a ready writer. His clear and agreeable literary style is so well known to his colleagues that further comment is unnecessary.

The second narrative is a heart-rending record of his trials and tribulations as an inventor. It seemed, at times, as if every hand that should have been friendly was turned against him. Such encouragement as he did receive came almost entirely from foreign naval authorities; our own apparently regarded him as an obnoxious pest. Endowed as he was with a quite uncanny sense of the perfectibility of practically every mechanical device then existing on ship-board, and of the overpowering necessity of adopting new ones to meet the requirements of the rapidly shifting condi-

tions of naval warfare, he simply could not sit idle. His active brain forbade such supineness. In spite of official disfavor, that brain persisted in keeping busily at work producing instruments and machines many of which ought to have remained confidential accessories, jealously guarded for our own exclusive use. To enumerate and discuss all the inventions he produced would need more space than is at my disposition. Let it suffice to mention a few, commencing with his earliest, a boat detaching apparatus. Then followed a typewriter, a machine gun, an electric log, a breech-loading musket, gun-pointing by steam and by electricity, a range finder, an electric ammunition hoist, etc., etc., etc. All present-day gunnery is founded on his telescopic sight. Read the book and learn what a wide range of possibilities was opened to his vision; then shall you be able to appreciate the indebtedness of our navy, and unhappily, other navies as well, to this one man. The torpedo plane, which may eventually prove to be his most important contribution to naval battles, was never used by us although it was used by our Allies in the late war.

The third narrative deals with his preparation for the highest position he held while on the active list. That it was his ambition cannot be admitted; Fiske is far too modest. But he realized, while it was yet time, that every service advancement offers a new field of usefulness and duty, as with each step upwards he endeavored to fit himself for the next. This is the rule in the navy and Fiske is no exception. He grasped the fact that the scope of the commander-in-chief's responsibilities embraces the wider and more philosophical activities coming under the head of tactcs, strategy and plans of naval campaigns. His example is worthy of emulation. In consequence, he was well equipped to assume the work of Aid for Operations when called to that position by Secretary Meyer.

An unfortunate episode, indeed the climax of his career, practically terminated his active employment. All went well until, through a change of administration, Mr. Meyer was succeeded as Secretary of the Navy by the present incumbent, whose views on preparedness and naval matters generally were in marked contrast with those of his principal official adviser. It is manifestly improper for me to discuss this clashing of opinions on the part of two high officers, each of whom believed himself in the right. The details, from Fiske's standpoint, are given in several chapters towards the end of the volume wherein those who wish may find them. Indeed, all naval officers should read those chapters to understand his attitude, whether they agree with Fiske or not. His record entitles him to a hearing, at least, in the court of service opinion. The outcome of this inability to work towards an end approved by both these gentlemen was Fiske's resignation of his post a resignation but tardily accepted and then under circumstances that bespoke the grave disapprobation of his superior.

It is, however, quite within the proprieties to commend Fiske's action. When a subordinate, charged with weighty responsibilities, finds himself in irreconcilable disagreement with his senior; when he feels that his self respect and his standing among his brother officers will be jeopardized by association with the execution of plans which he is convinced, rightly or wrongly, are detrimental to the good of the service as he sees it, it becomes

his plain duty to sever at all cost his relations with a chief to whom he cannot render unreservedly loyal support. Such was the situation as it seemed to Fiske and he met it with rare moral courage. His manner of exit from the Navy Department proved that he was faithful to his conception of esprit-de-corps and that devotion to "The good of the Service" which are the embodiment of the navy's best traditions if not its very soul. His sacrifice, while great, did not cause him to lose the respect of his colleagues and it set up an example which should be followed invariably in similar cases.

C. F. G.